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Conservation of Effort in Purchasing

A System of Keeping Records That Enables the Purchasing Agent to Keep in Touch with Conditions Outside His Office

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A purchasing agent must be prepared, at all times, to afford ready information on the prevailing facts concerning the products of the world without his organization, to answer questions arising within it and to co-operate in the fullest measure with all departments of his concern. He must, therefore, so limit the clerical work devolving upon him personally, as to permit giving a portion of his working day to keeping in touch with outside conditions. Many buyers regret that the daily duties incident to keeping a business supplied with its necessities, preclude giving the time they would wish to give to interviewing callers, and following other lines of research, to determine the conditions which exist in the commercial world.

Every time a salesman is banished unheard, the buyer and his firm sustain a loss in purchasing power, which time augments, as rumor spreads the tale; but there is a subtle injury besides that affects the buyer preeminently, and is often overlooked. It is the result produced upon him when he diverts his attention from the broadening to the narrowing functions of his office. If this course of action becomes a habit it will produce either egoism or narrowness, depending upon whether the habit is developed through choice or thoughtlessness. The buyer who is interrupted in the performance of routine duties may deny such interruption, or neglect those duties; or he may do neither. He may instead eliminate the necessity for such a choice and adopt the only remedy for overwork, which has always been more effective work properly systematized.

The directing of purchases, the approval of payments and co-operation with the other departments of his concern are obviously the foremost duties of the purchasing agent. His chief concern should be to know what to buy and when, where and how to buy it. So many factors enter into these considerations that any system employed to cover the details of purchase and consumption should be as comprehensive as possible, but it need not be complex. The requisition, the purchase order, the invoice, the record of receipt, and the departmental debit slip of distribution are the five original factors that contribute the essential information for any purchasing system.

A comprehensive system for classifying purchases has been broadly advertised and installed in many large concerns by a commercial house that has specialized in the systematizing of all kinds of office records. Therein a permanent inventory of every article purchased is obtained by transferring to large cards a portion of the data from each of the last four original sources mentioned above. This system, admirable because of its advantages of permanent inventory and material classification, is open to criticism on fundamental grounds. Every minute given to its upkeep is spent in duplication. Transcription has lessened the reliability of all data recorded. Efficient maintenance is unduly exacting, and when effected does not sufficiently reduce the work necessary to check properly invoices and receipts. The misplacement or loss of a card is very troublesome, for no complete duplicate record exists, and the original records are scattered widely through the various filing systems of the plant. Misplacement is not unusual, for the filing classification, derived from the purchase order is frequently at variance with the description of the commodity on the invoice or the receiving slip. The probability of loss, while less remote, is not less objectionable because of the great difficulty of replacement. The considerable volume of the card file and the special desks required for its convenient storage, combined with the probable necessity of that storage being beyond the reach of the buyer when at his desk are secondary disadvantages. Active cards are so frequently handled as to impair their record value, and necessitate transcription, additional duplication, increased liability of error. Inactive cards which form a large portion of the file, for uniformity's

Consignor S. W. Card Mfg Co Date 3/31/14

Quantity		Price
26	Special Taps 1/2-20	50 ea. 45%
12	do. 5/16-18	50 ea. 30%
		Carrier
		Truck
		Charges
		None

Order 35 Invoice 3427 Amount 12.75 Delivery F.O.B.

Form Showing a Record of Goods Received. These Are Made Up Eight to a Page for Use by the Receiving Department. Full-size Duplicate Pages Without Perforations Hold Carbon Copies of the Records. The Information Shown Dotted Is Filled In with Red Ink by the Purchasing Agent's Office

*Purchasing agent, J. H. Williams & Co., Brooklyn, N. Y.

sake, are cumbrous, unwieldy and wasteful of space.

Most other systems of which the writer has knowledge may be condemned for the unpardonable fault that they do not afford in compact form, under a material classification, the complete record of each and every purchase for instantaneous reference. Conscious that the purchase systems in general use left much to be desired, the writer several years ago gave careful study to the problem of developing for use in his own department a system better suited to that department's needs. The conclusions reached were as follows:

1. All vital statistics of each purchase should be recorded upon one of the five original records that contribute the information applicable to that purchase.

2. The filing of the complete record should be under a material classification, in chronological order.

3. The original record used as the groundwork of the system should conform to a standard size, cover but one class of material and be accessible elsewhere in duplicate form.

4. The size of the record best suited for accessibility is such as can be conveniently filed in the top drawer of the purchasing agent's desk.

5. The original record selected should be one that is available to the department before the transaction is finally closed and the invoice surrendered for vouchering.

6. The conclusions stated and other valid reasons stamp as impractical or in some way extremely undesirable the selection of the requisition, the purchase order, the invoice or the departmental debit slip of distribution forms for the groundwork of this system.

Difficulties were encountered in adapting the record of receipt to the purpose; principally because this record was kept in a bound book by the receiving department, necessitating the submission to that department of all invoices for the checking of goods received. This delayed the approval of invoices, and their occasional loss occurred. It offered to human frailty, moreover, the temptation to approve without the careful counting or weighing that would be necessary if the invoiced amounts were unknown.

A post binder was supplied the receiving department to retain the permanent feature of the old system and the purchasing department assumed the responsibility of checking receipts. Padded duplicate forms of suitable dimensions, with margins punched to fit the binder, were supplied. The original page was perforated to permit of its being easily torn into eight 3 x 5-in. cards printed as illustrated. The second sheet, of a different color, was not perforated or printed. The receiving department was asked to enter but one class of goods on a card, using black ink for their record, which should reveal date of receipt, consignor's name, quantity and description of merchandise, identity of carrier, all receiving charges and notes of condition on arrival when necessary. The pages so inscribed are delivered daily to the purchasing department, torn apart and filed alphabetically according to consignors' names. The duplicate pages bearing the carbon copy are retained in the post binder in the receiving room, serving as efficiently as the former record and furnishing a means for the renewal of any lost card.

When invoices are received extensions are checked in the accounting department, and the purchasing agent initials prices O. K. and records the terms of delivery thereon; the filing clerk then lays before the office assistant the purchase order, invoice and receiving slip. The assistant affixes in red ink on the receiving slip the date of order and invoice, the terms of delivery and the cost. He initials goods received on invoice, transcribes date of receipt and order thereon, classifies items for cost distribution, compares terms of delivery on invoice and receipt slip, deducts or charges back unwarranted transportation costs and stamps purchase order complete for permanent filing. The invoice is then turned over to the accounting department, and the receiving slip filed in the purchasing agent's drawer under a material classification.

The same index affords on auxiliary cards for each commodity lists of the sources of supply, with catalogue references, quotations, etc., and its existence obviates the necessity of a price card index or of a price book record. A card cabinet within reach of the purchasing agent contains the records of previous years.

If it is desired to maintain a permanent inventory the above system lends itself readily to that end. The only additional work that is necessary is to carry forward the totals of each successive slip, and file the departmental debit slips of distribution, similarly totaled progressively, in the same index. A balance may then be struck at any time by a comparison of the last slips of receipt and expenditure.

The system is flexible and is generally applicable to business of any magnitude. It is compact and gives a maximum of information to the cubic inch of filing space. It is automatically accumulative, may be started at any time, and becomes effective from its inception. It involves a minimum increase in routine clerical work over that required to perform that work without it. It conserves the time of the purchasing agent, permitting him to give proper consideration to outside conditions, and to analyze internal requirements and ultimate economies.

Detroit Foundrymen's Association

The Detroit Foundrymen's Association held its annual meeting and banquet at the Cadillac Hotel, Detroit, Mich., on the evening of May 14. The following officers were elected: President, A. F. S. Blackwood, Michigan Steel Casting Company; vice-president, Robert Carolin, Robert Carolin Brass Company; secretary, William A. Fletcher, American Blower Company; treasurer, E. I. Chase, Cadillac Motor Car Company. Executive Board—H. W. Johnson, Fairview Foundry Company; J. A. Moore, American Blower Company; Edw. Bierwirth, Russel Wheel & Foundry Company; J. W. Collins, Aluminum Castings Company. E. J. Woodison acted as toastmaster and introduced several novelties in the way of entertainment features. The reports of the secretary and treasurer showed the association to be in a prosperous condition. The year just ended was a banner year in the way of attendance, new members and high standard of papers read at the meetings.

Walter D. Sayle has been appointed receiver of the Avery Stamping Company, Cleveland, Ohio, as a result of a suit brought by some of the employees. It is stated that the company's liabilities are $50,000 and assets less than half that amount. The Avery Company, which owns the site and factory operated by the Stamping Company, has also been placed in the hands of a receiver, Edward E. Newman having been appointed for that purpose.

The plans of the Broken Hill Proprietary Company, Ltd., Newcastle, New South Wales, call for the erection ultimately of four 350-ton blast furnaces. One furnace is now under construction. Of ten 50-ton open-hearth furnaces projected three are now being erected. Work is in progress also on a 35-in. blooming mill and a 28-in. rail mill.

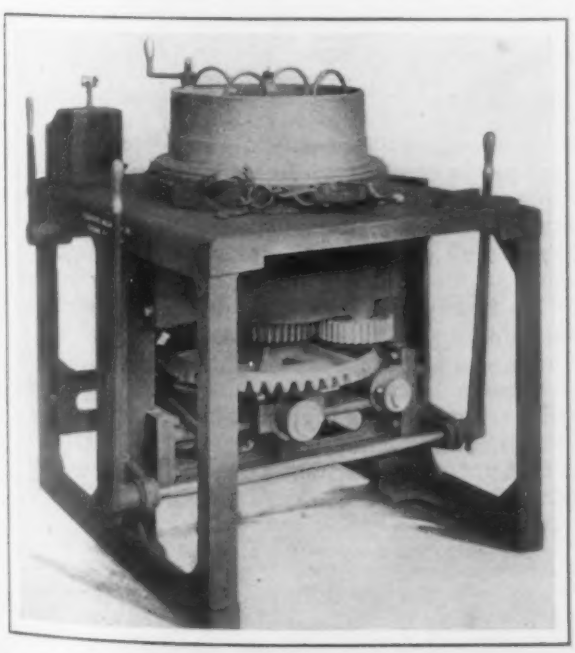
A New Machine for Drawing Small Wire

For drawing steel wire from ⅝ in. in diameter down, the Standard Machinery Company, Elmwood avenue, Auburn, R. I., has brought out a new machine. It is designed for use in connection with drums ranging from 22 to 30 in. in diameter, and can also be employed for drawing wire of copper and other precious metals. A feature of the machine is an attachment for starting the wire after it has been pointed and passed through the die.

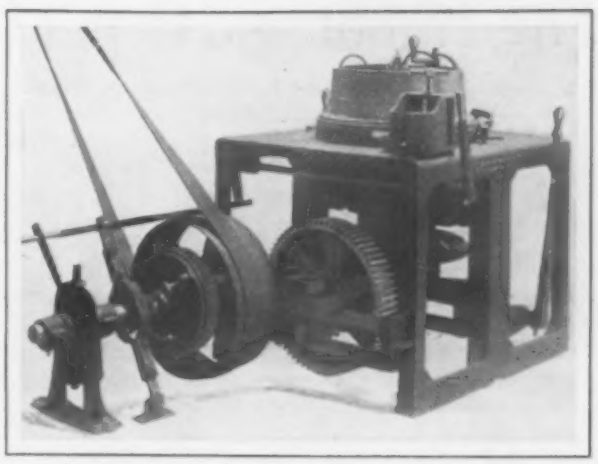
As will be noticed from the engraving, the construction is heavy and rigid, and there are sheet metal panels for covering the underworks, like the gearing, as a safety measure. The machine is driven by a friction clutch and the driving shaft is back geared to a large spur gear. This is located directly under the table and on the shaft with it is a bevel pinion that in turn meshes with the vertical spindle of the drum. The machine is then set in motion by throwing in the clutch with the shipper handle shown at the extreme left of the machine. The handle at the extreme right controls the operation of the internal clutch and the setting of the draw-out drum in motion.

Before the machine is started the wire to be drawn is inserted in the tongs of the wire starting attachment which pulls the wire through the die when the machine is put in motion. As soon as the drum has revolved as far as the back of the machine, the hand lever on the tongs of the starting attachment is hit by the knockout and automatically opened, the action throwing the main drawing drum into operation. The wire that has been started in this way which is equal in length to half the circumference of the drum, is then clamped in the jaws on the top of the main drum, and the machine draws this continuously through the dies, which are supported as shown on the machine table. It will be noticed that there are yokes going up from the inside of the main drum, which are relied upon to prevent the wire from going any higher, and also to serve as a guide for the fastening of the coils.

These machines can be furnished for direct connection to the driving motor or in series. The diameter of the drum is 22 in. and the hight is 8½ in. The linear speed of the draw-out drum is 19 ft. per min. The clutch pulley is 24 in. in diameter, with an 8-in. face, the speed of operation being 92 r.p.m. The hight of the machine is 5 ft., the width 4½ ft. and the length, including the clutch and the outboard bearing, 7½ ft. The weight of the machine is approximately 4000 lb.



A View of the Special Wire Starting Attachment



Machine for Drawing Steel Wire Less Than ⅝ In. in Diameter and Wire of Copper and Other Precious Metals

Color in Safety Goggles

An effort to secure the proper goggle for workmen subject to the intense glare of incandescent metals has been undertaken by the F. W. King Optical Company, Cleveland, Ohio. It has been found that the smoked and blue glasses commonly used defeat their very purpose of minimizing eye-strain.

Two kinds of light rays are regarded as particularly injurious to the eyes, the chemical or ultra violet and violet rays, which have a deteriorating action on the tissues, and the heat or red rays which by their intense energy are probably the chief cause of eye-fatigue. Smoked or blue glasses offer no resistance to the former, it is claimed, and are therefore of no benefit except to exclude much of the glare; while red, orange and similar glasses transmit the very harmful heat rays. In order to make the ideal goggle, it is held to be necessary first to cut off the invisible violet rays and then reduce the visible spectrum so as to absorb heat or energy rays to a point that produces no eye-strain whatever. Of all the colors a yellow-green seems best to accomplish this. It not only reduces the light to the limits desired but it also distorts images less than any other. Moreover the variation of brightness of incandescent metals with temperature appears relatively the same through this kind of glass as through uncolored glass. An elaboration of this subject has already been printed in pamphlet form by the F. W. King Company, having reference for example to the correct glass for use in open-hearth work, cement burning and on the pulpit of the Bessemer converter and this pamphlet can undoubtedly be had for the asking.

Thirteen new school buildings to be devoted exclusively to trade training, and to provide accommodations for 10,000 boys and girls, are to be erected in New York City if present plans are carried out by the Board of Education. Five of these buildings are to be assigned to Brooklyn and two to each of the other four boroughs of the city. The plans for the extension of trade education are the result of a canvass of large employers begun by President Churchill of the Board of Education early this year. These 13 schools will represent the largest single advance in trade education made in this country.

The Trumbull Steel Company, Warren, Ohio, has placed an order with the Cleveland office of the Westinghouse Electric & Mfg. Company for a 750-kw. generator and a 300-hp. motor—the latter for driving the cold rolls—and a four-panel switchboard.

The Talbot and Other Open-Hearth Processes*

Results at Witkowitz Steel Works Favor the Former, Especially Where Pig-Iron Content Varies Widely, Also Amount of Scrap.

BY DR. FRIEDRICH SCHUSTER†

Since the founding of the Witkowitz works in 1829 a number of processes for manufacturing steel have been used owing to the constantly shifting sources of supply of raw material, as well as to keep abreast with the times. When low-phosphorus ores became scarce, the acid Bessemer process, originally introduced in 1867, was replaced by the basic Bessemer in 1879, or rather the two were run in combination, to be replaced entirely by the duplex process in 1882. The Duplex process was originated and developed at Witkowitz. In addition various modifications of the open-hearth process, both acid and basic, were operated at these works.

While the duplex process gave a quality of steel which left nothing to be desired and the output of the several furnaces was large, yet the cost of operating the separate Bessemer and open-hearth installations was such that a cheaper method was sought for. The basic Bessemer, by far the cheapest method for producing steel, was precluded by ore conditions. Scrap was not abundant enough at sufficiently low figures to make use of an all-scrap process for the relatively high tonnage requirements. Hence the only alternative was a pig-and-ore process.

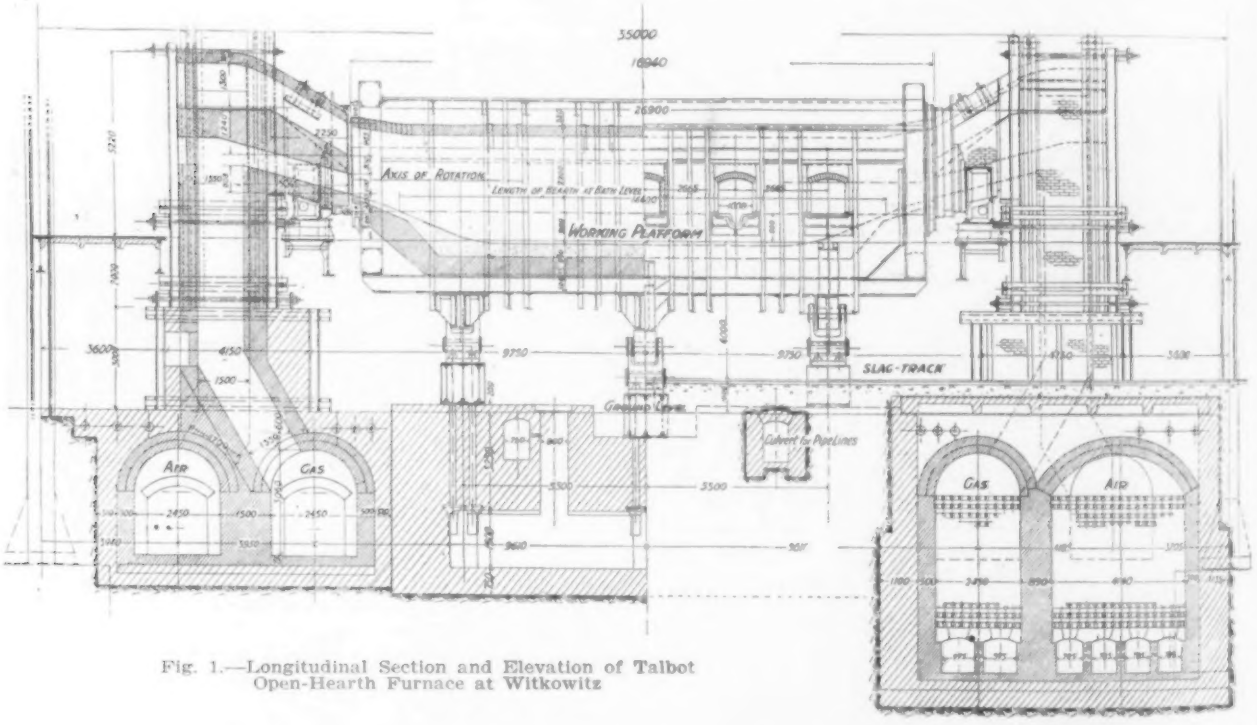


Fig. 1.—Longitudinal Section and Elevation of Talbot Open-Hearth Furnace at Witkowitz

REQUIREMENTS FOR THE NEW PLANT

The study of the situation was complicated by the necessity of a complete reorganization of the rolling mills as these were fairly antiquated. The dominating factors involved a removal of this department to an entirely new location one and a half miles away. It was necessary to select a steel making process giving great latitude in qualities, together with a minimum cost of production. Steam was to be replaced by electricity generated from waste blast furnace and by-product coke oven gases and transmitted to the new location. The plant had to be arranged for future expansion of each department independent of the others. Other requirements were these—the shortest transport of material from the raw to the finished state; the largest use of traveling cranes; floor space to be on the same level throughout the plant and kept clear of obstructions; accessibility of all moving parts from the floor level and replacement of manual labor by machinery wherever there was danger. The new construction included a lime kiln and dolomite plant; a gas-producer plant of 20 Kerpely units; a scrap storage yard commanded by cranes, with lifting magnets for pig iron and scrap; steel works plant, with blooming mill, soaking pit building, and adjoining the blooming mill a transformer station for the reversing mill which is driven by direct current; then the rolling mills consisting of 15 trains of rolls—an armor plate mill, three sheet mills, two universal mills, a reversing billet mill, a rail and girder train, a three high breaking down mill and medium and small mill trains. The area covered by roofs amounted to 1,130,000 sq. ft. and the yard storage with crane facilities 485,000 sq. ft. additional.

SELECTION OF THE TALBOT PROCESS

Not only was the rolling mill problem a serious one, but owing to the limited tonnage of each shape made at one time and the great variety of specifications gotten out, it became a truly "Austrian" situ-

*Translation, nearly in full, of a paper read at a general meeting of the Verein Deutscher Eisenhuettenleute, May 3, and at the London meeting of the Iron and Steel Institute, May 7, 1914.

†General manager Witkowitz Steel Works, Witkowitz, Austria.

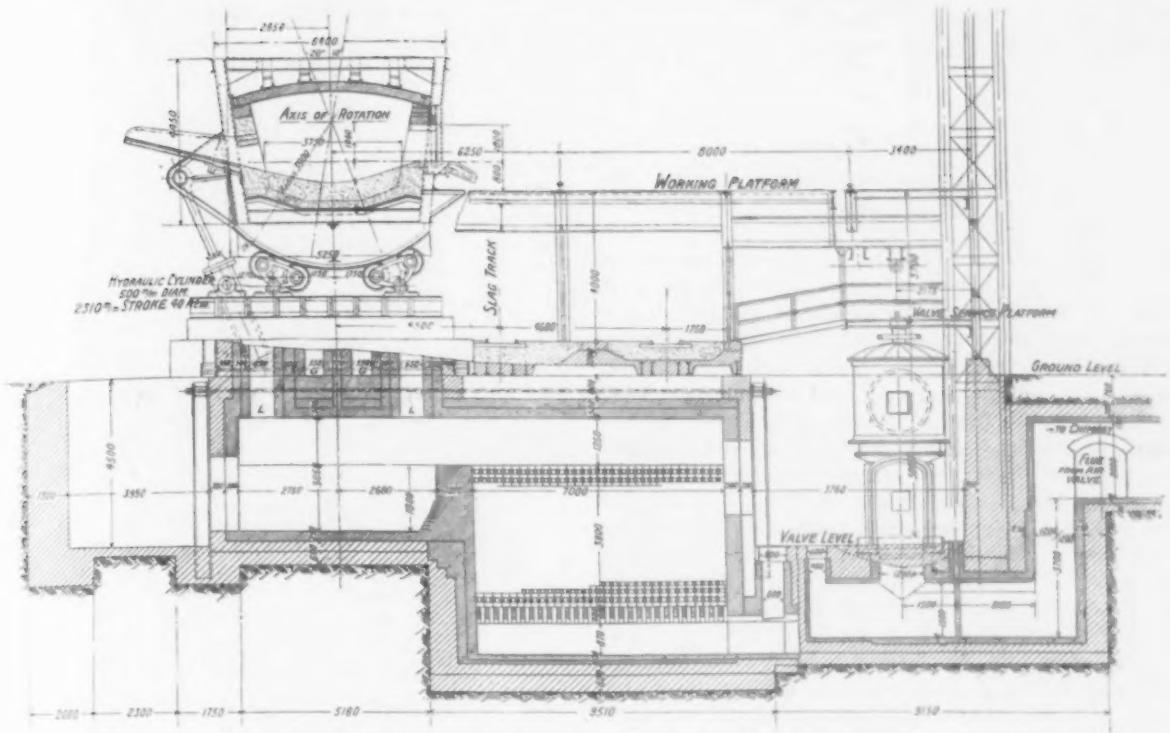


Fig. 2.—Cross-Section of Talbot Open-Hearth Furnace at Witkowitz

ation. It was necessary that the steel making process selected should allow one kind of steel to follow the other rapidly and with absolute assurance, and also make use of the scrap coming from the rolling mills continually. Another condition was the use of a pig iron with medium phosphorus content, as produced in the company's furnaces, and which could be used for steel making at lowest production figures.

Long continued studies and visitation of plants finally resulted in the adoption of a pig-and-ore process in the tilting open-hearth furnace. Naturally the management was much worried by the conflicting reports received. Thus, in connection with the tilting open-hearth furnace, while England and the United States gave excellent reports, it appeared strange that in view of the constantly expanding production of open-hearth steel in Germany, tilting furnace plants seemed to be almost absent. Undoubtedly this was due to the greater first cost, greater running cost, and greater fuel cost as compared with the stationary open-hearth furnace. Apart from England and the United States (where a 75-ton Talbot furnace was in operation as early as 1898) there was only one 175-ton Talbot furnace in operation in 1906—that at Senelle, France, which was shut down two years afterward.

In spite of this situation and the rather astonishing information that an American works, in building an addition to its existing Talbot installation, had adopted the duplex process which at Witkowitz it was decided to abandon, the studies were continued and Prof. Eichhoff and Mr. von Maltitz were sent to England to investigate all the Talbot

TABLE I.—*Comparison of Furnaces*

Furnace.	Dimensions of Hearth.[1]			Capacity of Chamber for each Half of Furnace.[2]		Average Weight of Charge.	Daily Production with Pig Iron containing [3]		Production per Square Millimetre Hearth Area with Pig Iron containing [3]		One Ton of Steel is produced with Pig Iron containing [3]				Kilos of Slag per Ton of Yield; Pig Iron containing [3]		Total P_2O_5 of the Slag; Pig Iron containing [3]		Per Cent., Chemical combined Iron in the Slag.
	Length.	Width.	Area.	Gas.	Air.		1·1 per Cent. P.	1·7 per Cent. P.	1·1 per Cent. P.	1·7 per Cent. P.	1·1 per Cent. P.		1·7 per Cent. P.		1·1 per Cent. P.	1·7 per Cent. P.	1·1 per Cent. P.	1·7 per Cent. P.	
	m.	*m.*	m^2.	m^3.	m^3.	Tons.	Tons.	Tons.	Tons.	Tons.	Mins.	Secs.	Mins.	Secs.	Kilos.	Kilos.	Per Cent.	Per Cent.	Per Cent.
Talbot . .	14·4	3·95	53·8	68	115	65·6	320	295	5·94	5·48	4	30	4	53	155	187	15·1	19·1	circular 9
Wellman .	10·5	3·75	36·4	68	101	62·8	200	175	5·49	4·81	7	12	8	13	200	250	10·9	13·2	,, 9·5
Open-hearth	10·0	3·60	33·0	68	101	55·7	170	150	5·15	4·54	8	30	9	36	175	210	11·2	14·2	,, 10·5
Mixer . .	14·4	4·50	61·0	68	115	ca. 30	450 = 500		ca. 8		...	...	...	...	...	...	...	...	,, 6

[1] Hearth dimensions at height of bath with an average charge. Width = maximum width.
[2] Chamber capacity, *i.e.* the part of chamber filled with bricks = capacity of chequer work + spaces.
[3] Assumed: Talbot with 5 per cent. scrap
Wellman ,, 13 ,, ,,
Open-hearth ,, 25 ,, ,,
} and using mixer iron.
The mixer production is entirely dependent on charge and output of pig iron.

plants being operated there. The result was a determination to make comparisons of the several open-hearth processes on a sufficiently large scale at Witkowitz and then to select the one best suited to the requirements.

The above-mentioned separation of the works units required the use of a heated mixer installation for the blast furnace metal. To care for the contemplated production of 800 tons of steel daily, and at the same time to allow for future expansion, it was decided to put up two tilting furnaces of about 300 tons capacity, using one as a heated mixer and the other as the Talbot furnace, or, in case of an unsuccessful result of the test, as the second heated mixer.

As a precautionary measure, in the event of difficulty in getting satisfactory service when various steel qualities were required for successive charges, it was decided to build three 50-ton to 60-ton fixed open-hearth furnaces in addition, and further, in order to test the merits of the tilting as against the fixed open-hearth furnace, a 60-ton Wellman tilting furnace was added. To complete the plant a small electro-steel installation of one 2-ton and one 6-ton electric furnace was provided, the small one to serve for melting ferromanganese and the larger one for the production of special steels.

The storage system and producer gas plant were so designed that it was possible to get exact figures in the case of each comparative test. It made the installations more complicated, but served its purpose best that way.

A COMPARISON OF THE FURNACES

Table I gives a comparison of the furnace dimensions as well as production data. The two large tilting furnaces are practically alike in construction, differing only in the shape of the bath. While the furnace built to serve as a heated mixer holds 300 tons of molten metal, the one for the Talbot process is arranged for only 200 tons. It will be noticed from the table, in which the dimensions are in meters, that the two furnaces have a bath 48 ft. long, a width of 13 ft. for the Talbot furnace and 15 ft. for the mixer. The depth is 3 ft. for the Talbot furnace and 3½ ft. for the mixer. The entire length of the tilting frame is 56½ ft. The other dimensions may be taken from the illustrations, Figs. 1 and 2.

In contradistinction to the English furnace construction in which the ports can be rolled away from the hearth, the two large tilting furnaces were made with stationary interchangeable ports, after the Friedrich system, which can be hoisted out. The hearth turns by hydraulic power, the central axis running through the gas port centers, giving excellent satisfaction in practice. All cooling rings, doors and door-frames are water-cooled, the doors, stack damper and reversing levers being operated by motors.

The Wellman tilting furnace has a length of bath of 35 ft., a width of 12½ ft. and a depth of 2 ft., holding roughly 60 tons.

The three stationary open-hearth furnaces have a length of bath of 33.3 ft., a width of 12 ft. and a depth of 2 1/3 ft. The checker chambers have been placed a little backward and the slag pockets are readily accessible. This arrangement places the chambers somewhat deep and gives longer uptakes.

The Talbot furnace has a single port each for gas and air, while the Wellman and the fixed open-hearth furnaces have two ports each for gas and air, an arrangement which will be changed to conform with the Talbot type at a future rebuilding. All furnaces have the interchangeable ports of the Friedrich system. The stacks for the large tilting furnaces are 173 ft. high and 6.7 ft. clear diameter. The four smaller furnaces have stacks of the same hight, but are only 6.3 ft. diameter inside the lining.

GENERAL OUTLINE OF OPERATIONS

The working procedure is as follows: The direct metal is brought to the steel works from the blast furnaces about 1 1/3 miles away, in standard gauge ladle cars holding 30 tons each. These ladles are preheated with blast furnace gas and after filling are carefully covered with a fire-brick lined cover, thus saving splashing as well as undue cooling in case of delays of several hours. A 50-ton crane takes off the cover, lifts the ladle from the car and places it on another one running between the furnace house and the casting house, from which another 50-ton crane picks it up and empties the metal into the mixer. Before the entrance of the molten metal, the mixer has been charged with about 3½ per cent. ore and 1 per cent. limestone.

Experience showed that the best results are obtained when the mixer is used as a receiving basin only, and no attempt is made—as is done at other works—to do very much refining in it. While it is the aim to prolong the life of the hearths as much as possible by using silicons below 1 per cent., the effort is to remove this impurity in the mixer to the largest extent, and with good success. Moreover, the mixer is advantageous in the desulphurization of the iron; in fact, even during the transportation of this metal from the blast furnaces as much as 50 per cent. of the sulphur has been occasionally removed. The average of a long series of observations indicates that 36.5 per cent. sulphur and 12.06 per cent. manganese is removed while the iron is in the ladles in transport. As the covering up of the metal in the ladles keeps it from skulling even when left stand for four hours, it is possible to draw upon the mixer just as wanted by the open hearths and refill from the ladle directly after.

METAL AND SLAG ANALYSES

The following figures give the averages of direct metal, iron from the mixer, and the mixer slag, as obtained during these tests:

Direct metal: Silicon averages ran from 0.54 to 0.83; manganese, from 1.56 to 2.11; phosphorus, 1.74 to 0.55; sulphur, 0.06 and 0.07.

Mixer metal: Silicon from 0.17 to 0.21; manganese, 0.86 to 0.94; phosphorus, 1.67 to 1.07; sulphur, 0.03 and 0.04.

Mixer slag: Direct metal being 1.1 phosphorus, the silica ran 29.92, the phosphorus 1.78, and the iron 5.99. With direct metal of 1.7 phosphorus, the silica ran 29.60, phosphorus 1.96, and iron 4.51.

About 500 tons of iron passed through the mixer every 24 hours; with a surface of 657 sq. ft., this means an average production of 7.6 tons per sq. ft. For every ton of mixer metal there was charged 2127 lb. direct metal from the blast furnaces, 64 lb. pig iron, 77 lb. ore, and 22 lb. limestone.

The entire series of tests, beginning with May 10, 1913, produced about 150,000 tons of mixer metal, using an average fuel percentage of 132 lb. per ton. The yield was practically 100 per cent.

The mixer allows a complete independence of the run of the blast furnaces, it being possible to furnish the secondary furnaces with metal of a uniform composition at all times. The actual increase in production on the part of the steel made, after the mixer was put into commission, was a round 30 per cent. In addition there is a possibility of using small quantities of pig iron or even scrap in the mixer without perceptibly increasing the fuel percentage.

TALBOT FURNACE PRACTICE

As soon as the 200-ton bath of the Talbot furnace has reached the required composition, about 65 tons of steel is tapped into the ladle and the necessary ferromanganese added. The remaining 135 tons of steel is allowed to stay in the furnace under a heavy slag cover for about 10 to 15 minutes. After plugging the tap-hole and making any necessary minor repairs about the slag line, the ore and lime necessary for the next charge are introduced by means of charging apparatus. These additions are sufficiently heated up in 15 to 20 minutes to allow the first 30 tons of mixer metal to be introduced, this coming in a ladle. A violent reaction between ore and mixer metal takes place, the carbon content of the latter being oxidized to CO. The reaction is oftentimes so severe that it is necessary to cut off the supply of regenerated air and open the doors to relieve the furnace pressure. In spite of this reaction, however, the bath is perceptibly cooled. In half an hour it has become quiet enough to add the second ladle of mixer iron and a much milder reaction takes place. The heat is now run up sharply until the charge is properly liquefied.

The carbon content of the finished bath of steel will vary according to the products required, being 0.07 to 0.08, with manganese about 0.30, and phosphorus 0.02 to 0.03 per cent. The greater part of the slag cover is tilted out to one side of the platform and if required the necessary ore and lime charge added to complete the operation.

The length of the heats, with same scrap percentage, will vary with the phosphorus content in the mixer metal, and shows no serious retardation up to 1 per cent. With 1.8 per cent. phosphorus the time is increased by about 8 per cent., with a corresponding decrease in the day's production of steel. The oxidation of the silicon, manganese and phosphorus after the ore addition takes place at a comparatively low temperature, and if sufficient lime is added, will be complete by the time the charges are fully melted. The oxidation of the carbon depends upon the degree of concentration of this element, the temperature existing and the rate of melting. The higher the temperature the quicker the reaction, which in the case of the Talbot furnace, with its comparatively high temperature at the beginning of the heat, is quite marked. The rate of melting is very important, for in decarburizing, as well as the decomposition of the iron carbide which in the case of the white irons includes all the carbon, considerable heat is required. According to Campbell, it takes 705 calories to take care of 1 kg carbon. Moreover, the heat developed by the almost instantaneous combustion of the CO formed is above the bath and therefore practically lost to it, and hence, in spite of the combustion taking place, there is an actual cooling.

PRACTICE WITH TILTING AND FIXED FURNACES

In the Wellman tilting furnace the required charge of scrap, ore and lime is first introduced, and then come the two ladles of mixer metal. The operation then goes on in the usual manner as found in the regular stationary open hearth furnace. Just before tapping the slag is run off into slag buggies, at one side of the platform, and the steel with any remaining slag tilted into the ladle. Recarburization is effected in the ladle in the usual manner. The Witkowitz experience indicates that the best results are obtained when 10 to 15 per cent. of scrap is used.

The three 50-ton to 60-ton stationary furnaces, as stated previously, were intended to care for the scrap coming from the rolling mills on the one hand, and on the other for making special grades of steel as required. The operation of these furnaces is therefore no different from the case of the usual scrap-pig iron process.

SATISFACTORY STEEL BY ALL PROCESSES

The following points were considered in making the elaborate tests in question, which lasted practically a year. It was necessary to prove that each system tried could deliver steel of the qualities required; that even with iron of varying composition it was possible to obtain steel of the desired qualities together with a sufficient tonnage and at low enough cost. Each furnace tested required the establishment of the most favorable conditions of working, particularly the relation between direct metal from the blast furnace and solid scrap added. Finally the question was which system, as based upon the foregoing, would suit the conditions best from an economical standpoint?

The investigations show that it was possible to secure from each of the three systems tried out a uniformly good steel of the desired physical and chemical constitution. The original fear that, for instance in the Talbot furnace, it might be impossible to get billets, soft and hard sheets, rails, etc., in relatively short intervals one after the other, proved to be unfounded. Not only was it possible readily to obtain this result, but also to make steel for seamless tubes, both hard and soft, a product known to be most difficult to make satisfactorily.

The range of products made is well illustrated in the following: Gas and other pipe, seamless tubes (soft), drop forge steel, beams, plates, lightning rods, spring steel, rails (Austrian). The carbons ran from 0.09 (gas pipe) to 0.48 (rails); manganese, 0.43 to 0.87; silicon in spring steel and rails, 0.24 and 0.12; phosphorus from 0.02 up to 0.04, and sulphur, 0.017 to 0.030.

VARIATIONS IN CHEMISTRY AND IN SCRAP

In order to test the range of composition of the blast furnace metal wide variations in compositions were made for long continued periods, and every kind of steel required was produced satisfactorily. In phosphorus the steps represented the following average percentages: 0.50, 0.75, 1.00, 1.50 and 1.75. The manganese percentages tried ran from 1 up to nearly 3.

While there was no difference to be noted in the quality of product got from each of the three systems tested, it was observed that for tonnage production there was a variation when the phosphorus content ran considerably over 1 per cent. For instance, with the phosphorus at 1.75 the production of the Talbot furnace dropped about 8 per cent., and that of the Wellman and the stationary open hearths about 12 per cent., as compared with a production on the 1 per cent. phosphorus basis. It is to be observed, however, that with the higher phosphorus percentage the value of the slag made increases, and consequently this offsets the loss proportionately.

After a long series of tests it was concluded that the Talbot process is most effective when the quantity of scrap added was a minimum. Up to 5 per cent. of scrap did not matter, but above this the cooling of the bath was marked, the time of the heat extended and the production decreased.

The fixed open hearths gave their best results with a 25 per cent. scrap charge. A rise in the phosphorus content affected the results seriously as shown above. Trials in these furnaces with mixer metal only, or with very small scrap percentages had to be abandoned soon, as the slag quan-

tities became a nuisance, and it was seen that this would not solve the problem.

BASIS OF COST COMPARISONS

In judging the running cost of the three systems the following points were considered. 1. Relation of the first cost independent of the building put up and local conditions. 2. Fuel expenditure. 3. Expenditure for ore and lime additions. 4. Durability of the furnaces and consequent repair material and labor. 5. Remaining costs, such as supervision, water, current, ingot molds, etc. 6. By-products.

One of the main objections of the tilting furnace will always be its comparatively high first cost, this depending not so much on the dimensioning of its parts as the economic condition of the country where it is put up. Comparisons are only possible where furnaces of several types are put up side by side as at Witkowitz. Naturally, actual figures cannot well be given, but the comparison made in the following is based on absolutely accurate costs. The construction costs of the Talbot, Wellman and fixed open hearths were in the ratio of 1659 : 1259 : 1000.

Comparing this first cost, however, with the daily production of these furnaces, quite a different set of figures is obtained, and the Talbot, Wellman, fixed open-hearth furnaces compare as 882 : 1070 : 1000. These figures take into account not only the first cost of the furnaces themselves, but the ground floor occupied in the buildings, though not the accessory apparatus, as charging machines, cranes, etc.

The following table summarizes the operating results of the three systems in question, using iron with 1.1 as well as 1.7 per cent. phosphorus. It will be noticed that in practically every point, as fuel, refractories, lime, direct metal, and oxides added, the Talbot system came out best, the Wellman next and the fixed open hearth last. The recovery of iron from the added oxides is as follows: Talbot furnace, 86 per cent.; Wellman furnace, 80 per cent., and the fixed open hearth, 78 per cent.

TABLE 2.—*Working Results of the Three Open-Hearth Systems*

Material per Ton of Steel	Talbot furnace per cent. P. 1.1 Kilos	Talbot furnace per cent. P. 1.7 Kilos	Wellman furnace per cent. P. 1.1 Kilos	Wellman furnace per cent. P. 1.7 Kilos	Fixed furnace per cent. P. 1.1 Kilos	Fixed furnace per cent. P. 1.7 Kilos
Charge:						
Pig iron (and mixer iron)	890	878	845	837	745	738
Scrap	67	66	115	114	246	244
Ferro-manganese and FeSi	6	6	7	7	7	7
Oxides:						
Gellivara ore	133	160	137	165	123	147
Mill cinder, etc.	37	44	34	41	22	27
Lime	90	108	93	116	91	109
Refractories Material:						
Dinas and refractory bricks	17	18	30	34	37	42
Magnesite and dolomite	15	16	17	19	20	22
Chrome ore	0.5	0.5	0.5	0.5	1	1
Fuel:						
Coal for furnaces	206	221	230	260	272	307
Coal for mixer	52	52	47	47	35	35
Coal for steam	18	19	20	22	22	24
Current units	7.8	8.4	7.8	8.8	7.8	8.8
Kilos of slag	155	187	200	250	175	210
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
P_2O_5 in the slag	15.1	19.1	10.9	13.2	11.2	14.2
Yield	103.8	105.2	103.4	104.4	100.2	101.1
Oxides to pig iron	19.1	23.2	20.2	24.6	19.6	23.6
Scrap to charge	7.0	7.0	12.0	12.0	25.0	25.0

The slag quantities are naturally lowest in the Talbot process, highest in the Wellman, and owing to the use of greater quantities of scrap in the straight furnaces, this is of medium quantity. The Witkowitz experience further indicates that the phosphorus content in the Talbot slag is highest, in contradistinction to published reports on the subject. The higher the phosphorus in the charge the higher the phosphoric acid is in the slag, being almost proportional to the percentage of slag per ton of steel made. Here are typical analyses of the Talbot slag:

	Pig iron with 1.1 per cent. P. per cent.	Pig iron with 1.7 per cent. P. per cent.
SiO_2	9.43	9.24
FeO	8.63	8.10
Fe_2O_3	6.56	2.15
Al_2O_3	4.02	2.08
MnO	7.33	4.37
CaO	41.97	50.61
MgO	5.87	3.58
S	0.38	0.28
Total P_2O_5	14.70	19.02

TABLE 3.—*Charge and Yield*

Phosphorus in Pig Iron / Scrap in Charge	1·1 per Cent. 5·0 ,,		1·1 per Cent. 15·0 ,,		1·7 per Cent. 10·0 ,,		1·7 per Cent. 3·0 ,,	1·1 per Cent. 25·0 ,,
	Talbot, Kilos.	Wellman, Kilos.	Talbot, Kilos.	Wellman, Kilos.	Wellman, Kilos.	O. H., Kilos.	Talbot, Kilos.	O. H., Kilos.
Average per ton crude steel—								
Liquid pig iron	42	36	70	69	47	17	59	7
Mixer iron	868	836	744	735	806	822	847	545
Solid pig iron	5	31	3	13	2	20	6	178
Total	915	903	817	817	855	859	912	730
Scrap	41	58	140	142	87	91	27	248
Ferro-manganese	6	6	6	6	6	6	6	6
Ore	124	144	123	147	167	190	139	122
Oxides (cinder, &c.)	54	38	44	44	40	22	79	25
Slag, per ton of steel	160	206	151	198	240	249	208	185
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Oxides in pig iron (calculated)	19·5	20·1	20·4	23·3	24·2	24·7	23·9	20·1
Scrap in metallic charge	4·3	6·0	14·5	14·7	9·2	9·5	2·8	25·2
Yield	103·9	103·4	103·8	103·6	105·4	104·8	105·8	101·6
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Production per furnace per day	317	197	290	202	180	140	292	155

TABLE I.—*Costs of Talbot and Other Open-Hearth Processes at Witkowitz, Compared with Open-Hearth Costs in Western Germany*

		Basic Process (according to Schock's Table).			Scrap and Pig Process (according to Schock's Table).			Pig and Ore Process (according to Schock's Table).			Talbot Process (New Steelworks, Witkowitz).			Wellman Process (New Steelworks, Witkowitz).			Open-Hearth Process (New Steelworks, Witkowitz).			Duplex Process (Old Open-Hearth Works, Witkowitz).		
Phosphorus in pig iron (approximate)		1·8 per Cent.			1·8 per Cent.			1·8 per Cent			1·7 per Cent.			1·7 per Cent.			1·7 per Cent.			0·4 per Cent.		
Yield		89·5 ,,			96·0 ,,			107·0 ,,			105·2 ,,			... ,,			101·1 ,,			88·0 ,,		
Loss of balance		0·6 ,,			1·6 ,,			0·8 ,,			...			...			...			3·1 ,,		
Daily production		1063 tons			159 tons			1484 tons			295 tons			175 tons			300 tons			514 tons		
	Cost per Ton, Shillings.	Weight per Ton of Yield.	Shillings per Ton of Yield. Item.	Total.	Weight per Ton of Yield.	Shillings per Ton of Yield. Item.	Total.	Weight per Ton of Yield.	Shillings per Ton of Yield. Item.	Total.	Weight per Ton of Yield.	Shillings per Ton of Yield. Item.	Total.	Weight per Ton of Yield.	Shillings per Ton of Yield. Item.	Total.	Weight per Ton of Yield.	Shillings per Ton of Yield. Item.	Total.	Weight per Ton of Yield.	Shillings per Ton of Yield. Item.	Total.
Charge. Basic pig iron	44·0	Kilog. 1090·0	47·96		Kilog. 260	11·44		Kilog. 613·0	35·77		Mixer Costs. 878	3·80		Mixer Costs. 837	3·45		Mixer Costs. 738	2·57		1068·1	47·0	
Scrap	56·0	20·0	1·12		767	42·95		115·6	6·47		66	36·82		114	6·38		244	32·47		56·1	3·14	
Ferro-manganese	200·0	6·5	1·30		9	1·80		6·0	1·20		6	3·70		7	1·40		7	13·66		9·0		
Ferro-silicon	...	...	...		...	...		...	...		...	1·20		...	...		...	1·40		0·7	2·20	
Spiegeleisen	...	...	...		...	...		...	...		...	...		...	...		...	...		1·3		
		1116·5		50·38	1036		56·19	934·6		43·44	950		47·33	958		48·05	989		50·10	1135·2		52·34
Cost per ton of charge			(45·12)			(54·23)			(46·47)		With Mixer	(49·82)		With Mixer	(50·15)		With Mixer	(50·66)			(46·11)	
,, ,, scrap and pig			(44·21)			(52·96)			(45·50)		Without Mixer	(44·84)		Without Mixer	(45·42)		Without Mixer	(46·97)			(44·60)	
Oxides. Swedish ore	28·0							150	4·20		160	4·48		165	4·62		147	4·12		27·2	0·76	
50 per cent. manganese ore	42·0							18	0·75													
Cinder (own)	15·0				35	0·525		20	0·30		44	0·66		41	0·61		27	0·41				
,, (bought, slag)	17·0						0·525	87	1·48	6·73			5·14			5·23			4·53			0·76
Total ore and metal				50·38			56·715			50·17			52·47			53·28			54·63			53·10
Lime	12·0	150	1·80		60	0·72		125	1·50		108	1·30		116	1·39		109	1·31		78	0·93	
Fluorspar	25·0				1	0·025		1	0·025													0·93
				1·80			0·745			1·525			1·30			1·39			1·31			
Fuel. Cost of gasifying	19·0											0·98			1·15			1·37				
Coal					220	4·13		220	4·18		221	4·20		260	4·94		307	5·84		267	5·07	
Coke, graphite, wood, &c.			0·24			0·125			0·10													
				0·24			4·305			4·28			5·18			6·09			7·21			5·07
Refractory Material. Chrome ore	65·0				1	0·065		1	0·065													
Refractory material for furnace						0·90			1·50			1·40			2·45			2·52			2·85	
,, ,, working			0·35			0·20			0·35													
Dolomite, tar, including wages			0·70			0·60			0·60													
				1·05			1·765			2·615			1·40			2·45			2·52			2·85
Various Expenses. Steam, gas, electricity			0·50			0·17			0·20													
Tools, stores, and spare parts			0·40			0·50			0·50			1·71			1·71			1·62			2·23	
Other operations, wages, material			1·00			1·00			1·00													
Direct wages, salaries, bonus			0·95			2·00			1·50			2·28			2·40			2·46			5·52	
Ingot moulds			0·50			0·50			0·50			0·50			0·50			0·50			0·50	
General, royalty, depreciation, &c.				3·35			4·17			3·70			4·49			4·61			4·58			8·25
Gross cost of production				56·82			67·70			62·29			64·84			67·82			70·25			70·20
	20·0	230 (17 p. cent.)	4·60																			
	3·0				140	0·42																
Less—Value of slags	23·80							145 (18·5 p. cent.)	3·40		187 (19 p. cent.)	5·75		250 (13 p. cent.)	3·50		210 (14 p. cent.)	3·20			0·52	
	2·50							165 (6·9 p. cent.)	0·41													
									0·48													
Steam and waste heat utilised				4·60			0·42			4·29			5·15			3·50			3·20			0·52
Net cost of production				52·22			67·28			58·00			59·69			64·32			67·05			69·68
Cost of conversion (referred to 1 ton of scrap and pig				8·01	Average 54·18		14·32			12·80			14·85			18·90			20·08			25·08
					8·83 Shillings																	
Comparative cost of production				100	104		129			111			114			123			128			133

The iron content in the slag in the first case is 11.3 per cent. and manganese 5.67, or total metallic content of 16.99 per cent., whereas in the second case these figures are 7.8, 3.38 and 11.18 per cent. The composition of the slag naturally depends a good deal upon the nature of the oxidizing medium used. The fewer silicates from the ore, the greater the concentration of the phosphorus.

THE LIFE OF THE FURNACES

Comparing the durability of the several furnaces, we have the following figures:

Talbot furnace.—First change of ends (Friedrich system) required after taking out 300 heats. Next change after a further 250 heats. Third change after another 250 heats. This with the same furnace roof. Or, 800 heats made, with 65.6 tons in each, giving a total of 52,480 tons of steel produced for this run.

Wellman furnace.—This made 220 heats before new ports and repairs to walls and uptakes, etc., were necessary; then again 220 heats. Total, 440 heats with the same roof. At 62.8 tons per heat, this meant 27,600 tons of steel.

Fixed open-hearth furnace.—Similarly 250 heats until ports and other parts had to be replaced; then again 250 heats. Total, 500 heats with the same roof. At 55.7 tons per heat, this made 27,800 tons of steel production.

This indicates the superiority of the Talbot furnace, and is mainly due to the faster operation and more intense reaction in it as compared with the other furnaces. In the Talbot furnace the oxides and lime added react from the great surface space of the bath downward to the bottom, whereas the Wellman and fixed open hearth furnaces react from the bottom upward, causing a long continued boiling of the bath, with consequent spattering of the walls, bridges and ports, and their eventual destruction. A further reason for this condition is the fact that in a furnace like the Talbot, where some molten metal is always left remaining, the lining is not subject to the serious fluctuations in temperature as is the case in furnaces which are periodically emptied out completely. The longer life of the refractories in the ladles for the Talbot furnace was distinctly noticeable, as compared with that of the ladles for the other furnaces. There was absolutely no slag in the first case, whereas in the Wellman furnace, and particularly in the fixed open hearths, the presence of more or less slag on the steel cut the ladle linings rapidly.

Finally it may be said that the miscellaneous charges against the cost of production ran lowest for the Talbot furnace steel.

FINAL COMPARISON OF COSTS

A summary of the total operating costs of the three systems tested out would be as follows: Talbot system, 100; Wellman system, 105; and the fixed open hearth, 107. These figures include the cost of operating the mixer.

In order to compare the Witkowitz costs with those of western Germany a paper by N. Schock [read at a general meeting of the Südwest Iron Works on February 15, 1914] was made use of. Placing the cost of basic Bessemer steel at 100, the figures of Schock show that the scrap-pig process would stand at 129, the pig-ore process at 111 (which seems a little low), the Talbot process at 114, the Wellman at 123, the fixed open hearth at 128, and the duplex process at 133. Putting the Talbot process figure in the above series at 100, we have the Wellman at 108, and the fixed open hearth at 112. The experiences at Witkowitz, as stated above, place these figures at 100 for the Talbot, 105 for the Wellman and 107 for the fixed open hearth. The only reason for this variation from the western Germany equivalents is the difference in prices of raw materials.

In order to obtain information regarding a most important subject, namely, the maximum output that can be obtained with each of the systems tested, a run of six weeks was undertaken, everything being accurately weighed night and day by a large staff of engineers and assistants. The materials charged as well as obtained were carefully analyzed, the metal spilled returned to the proper furnace, and everything carefully watched. The result of this test was that when the same raw materials were put in, and the same proportion of mixer metal and scrap was used—as nearly as might be—the same production was obtained. This is perfectly logical, as the ore addition is really dependent upon the amount present of the elements that are to be oxidized out. A variation of output is only possible when this percentage is shifted.

CONCLUSIONS

A summary of the final conclusions is given herewith:

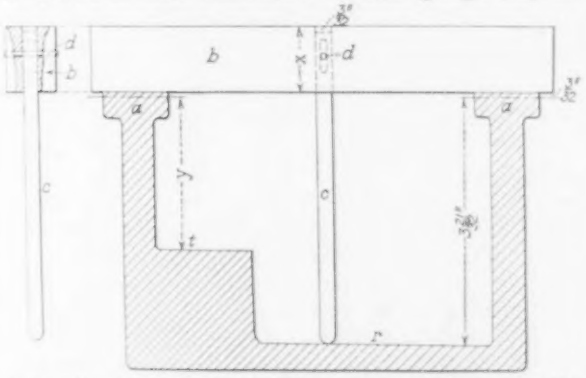
1. By the use of the heated mixer and refining only slightly therein, the output of the furnaces this serves can be increased by about 30 per cent.
2. The quality of the steel produced, both physically and chemically, is independent of the system selected.
3. The extent of the output is dependent upon the metal used, as well as the proportion of mixer metal and scrap making up the charges. Identical conditions in these points result in an identical output.
4. Where iron of varying composition is to be used and the range of scrap percentage is fairly wide, the Talbot furnace offers the best opportunity for economical work.
5. The Talbot furnace allows the use of the lowest up to the highest phosphorus percentages without damaging the quality of the steel made, the reduction of output in the case of high phosphorus being lowest in this system.
6. Although the actual first cost of the Talbot furnace is appreciably higher than that of a tilting furnace of small capacity, or of a fixed open-hearth furnace, these costs, calculated per ton produced daily, work out most favorably for the Talbot furnace.
7. The yield of iron from the oxide additions is highest in the Talbot system.
8. Where high phosphorus irons are used the phosphoric acid content of the slag is proportionately higher, meaning a greater profit from the slag in the case of the Talbot furnace.
9. The fuel economy of the Talbot furnace is greater than that of the other furnaces.
10. The life of the Talbot furnace is longer than that of the other furnaces, and hence the repair expenses are lower.
11. The operation of the Talbot furnace is easier and simpler than in the other furnaces, particularly as the slag can be tilted out more readily.
12. The labor involved in the Talbot furnace is not so severe, and comparatively fewer men are required for its operation per ton of output.

From the foregoing it would seem that for open hearth steel works producing medium and large quantities the Talbot system offers better returns than any other, and hence it may justly be called the open hearth furnace of the future.

A Simple Rapid Working Surface Gauge

A rapid working surface gauge which has a large range of uses in any shop where accurate dimensions are required on interchangeable parts has been developed by W. P. Kirk, 336 West Fourth street, Cincinnati, Ohio. The gauge is made up of only three pieces, the ground bar *b*, the round plunger *c* and the pin *d*. There is a reamed hole in the bar through which the plunger passes with a sliding fit, and at one end of the plunger there is a slot through which the pin is driven with a drive fit. If desired the hole in the bar can be bushed with a steel bushing, which, together with the plunger, can be hardened, ground and lapped.

The accompanying sketch brings out the method of using the gauge. The piece which is being machined measures 3¾ in. from the bottom *r* to the top, in the rough state, and is to be finished to 3 21/32 in. between the points *r* and *a*. The plunger is made exactly equal in length to the finished dimension plus *x*, which is the hight of the bar *b*. When the gauge is put across the surface of the piece, the plunger *c* will be below the top of the bar *b* a distance equivalent to the amount of stock to be removed, or in this case 3/32 in. As the surface at *a* is removed the gauge is put across and the operator draws the tip of his finger over the hole containing the plunger. In this way he can tell when he is down to the finished size much more easily than by any other practical means where rapid production is of vital importance. The surface *t* is to be finished at a distance *y* below the surface *a*. To determine when the proper amount of stock has been removed a similar gauge may be



A Recently Designed Rapid Working Surface Gauge for Use in Connection with Surface Grinding, Milling, Planing and Profiling Machines

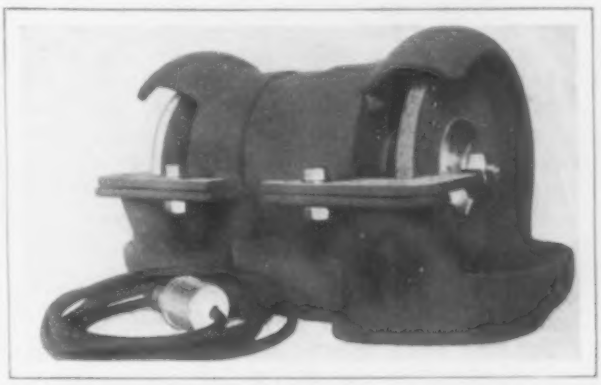
used, or an additional plunger can be put through the same bar, *b*, the length of this plunger being equal to *x* plus *y*.

Recommendations for safeguarding of machinery have been drafted for submission to the Pennsylvania State Industrial Board by a committee representing the steel forging industry of Pennsylvania, which met at Harrisburg May 15. Similar steps for safety are being taken by committees of various other branches of the iron and steel industry. The conference was attended by Carl B. Auel, Westinghouse Electric & Mfg. Company, Pittsburgh; C. S. Atkins, Scranton Forging Company, Scranton; L. E. Hickok, the D. Wilcox Mfg. Company, Mechanicsburg; H. E. Derbyshire, Chambersburg Engineering Company, Chambersburg; W. H. Kaiser, Metric Metal Works, Erie; Walter E. Chick, Pennsylvania Steel Company, Steelton, and George T. Fonda, Bethlehem Steel Company, South Bethlehem.

In the description of the gear cutting attachment for lathes of the Garrett Attachment Company, Nashville, Tenn., which appeared on page 1147, of *The Iron Age*, May 7, the captions under the two cuts at the top of the page were inadvertently transposed. The error, of course, was obvious to the reader.

New Type of Electric Grinding Machine

Four new models have been added to the line of electric grinding machines built by Forbes & Myers, 172 Union street, Worcester, Mass. The general construction of these machines is similar to the firm's standard machine for use with polyphase



A Recently Developed Grinding Machine Designed for Attachment to an Electric Light Socket

current, but the new machines are intended for use on lighting circuits and particular reference has been paid to the amount of starting current required, especially in the smaller size of machine.

A second size of machine, built for heavier work, has a ½-hp. motor, larger than is ordinarily used with a lamp socket; but a cord and plug can be furnished for such use, if desired. It is stated that this machine can grind lathe and planing machine tools, and handle ordinary work in a machine shop.

Two forms of frame are used with both sizes of machine. One of these, that illustrated, has a water basin and an adjustable tool rest and the grinding wheel is guarded. In the other style, the guard over the top of the wheel is omitted. The rotating element of these machines is the same as the earlier polyphase machines.

Both machines are equipped with two wheels, 6 in. in diameter, with a ½-in. face.

The Billings & Spencer Company, Hartford, Conn., has brought out an adjustable engineers' wrench. It is capable of being used wherever there is need for a solid end wrench, and in addition possesses the advantage of being adjustable for various sizes of nuts. The motion of the movable jaw is controlled by a worm meshing with a rack that is formed in the back of the jaw. The wrench is drop forged throughout and is made in four sizes, for handling ⅝, 15/16, 1⅛ and 1 5/16-in. nuts. The length of the smallest wrench is 6 in. and the largest 12 in., so that it can be used on automobiles, gas and steam engines, motorcycles, motorboats, etc.

The Special Libraries Association, which is composed chiefly of the business libraries with commercial, industrial, financial and engineering interests, will hold its annual convention at Washington, D. C., May 27 and 28, meeting simultaneously with the American Library Association, National Association of State Libraries, League of Library Commissions and American Association of Law Libraries. A programme has been issued which provides for a comprehensive discussion of subjects of interest to special librarians. The secretary-treasurer of the association is Guy E. Marion, librarian, Arthur D. Little, Inc., 93 Broad street, Boston, Mass.

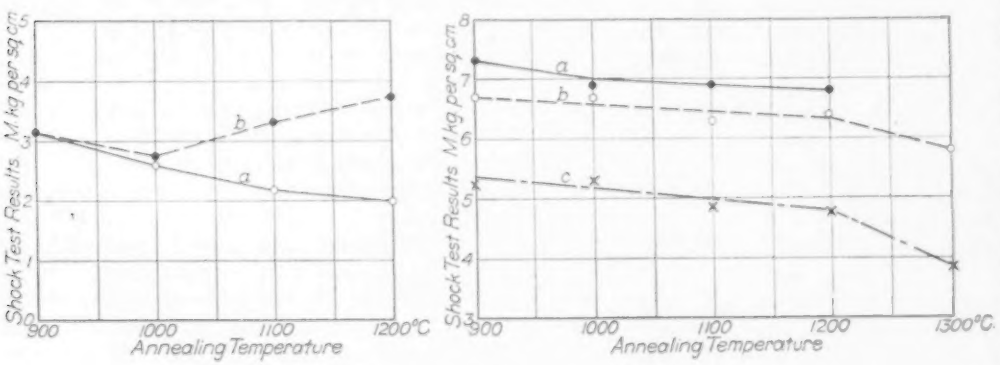
The Electric Furnace Company of America, Alliance, Ohio, has just booked a repeat order for a 200-kw. annealing furnace for use in a plant manufacturing table silverware at Niagara Falls, N. Y., and several orders for smaller furnaces.

The Shock Test and the Annealing of Steel

Conditions of Heating and Cooling That Affect the Dynamic Properties of Steel Castings and Forgings—Air Cooling the Most Effective

Professors Heyn and Bauer, of the Royal Testing Laboratories, Gross-Lichterfelde, Germany, published a report in two issues of Stahl und Eisen, dealing with the shock test and also giving observations on the anealing of castings, forgings, etc. The first part is on conditions affecting the results of the shock test. The size of the bar used for the test was the German standard, 8 x 10 x 100 mm., notched half way through, the notch having a circular end 1.3 mm. diameter. The metal left to stand the shock was 5 x 10 mm. in section.

The first tests were to determine the effect of the surface decarburization, which is always found after annealing. The steel used was a forged bar, 1.02 x 1.02 in., with carbon, 0.49; sulphur, 0.036; phosphorus, 0.035; manganese, 1.06; silicon, 0.34, and copper, 0.067 per cent. The steel as furnished gave an average shock test of 3.9. One series of test bars was cut 10 x 12 mm., the other to the final size, 8 x 10 mm. They were heated for half an hour at various temperatures and cooled in air, the first series being planed down on each side to 8 x 10 mm. The results are shown in Fig. 1, *a* being the bars from which the skin was planed. The resistance to shock of these bars steadily decreased with increasing temperature due to the coarse structure produced, while in the case of the other bars the low carbon skin increased the resistance to shock as shown in the diagram.



Figs. 1 and 2—Shock Tests on Forged Steel Bars

The second point taken up was the influence of the rate of cooling after annealing. The same steel was used as before, cut to 10 x 12 mm., heated and cooled either in air or more slowly in the furnace, and then planed to size. The bars cooled slowly were uniformly weaker than those cooled moderately quickly in air.

The next series of tests dealt with the question of the size of the initial sample on the final result. The steel used was forged to 1.02 x 1.02 in., its analysis being: Carbon, 0.29; sulphur, 0.043; phosphorus, 0.015; manganese, 0.56; silicon, 0.40, and copper, 0.053 per cent. Three series of bars were made, one cut to 10 x 12 mm., heated at the various temperatures and cooled in air; the second left as forged, 26 x 26 mm., heated and cooled in air, and the third, 26 x 26 mm., heated and cooled in the furnance. The average results of the bars planed down on each side to 8 x 10 mm. are shown in Fig. 2, *a* being the 10 x 12 mm. bars cooled in air, *b* the 26 x 266 mm. bars cooled in air, and *c* the 26 x 26 mm. bars cooled in the furnace. The steel as furnished gave an average shock test of 7.5. The results clearly show the influence of the coarser structure brought about by the slower cooling of the large bars.

Exhaustive tests were then made on the influence of annealing, and of forging with succeeding annealing on the resistance to shock of steel castings. Various steels were obtained from three works, ten in all, cast in bars, 1.97 x 1.97 x 19.7 in. (50 x 50 x 500 mm.). There were four bars of each steel, two as cast and two given the usual annealing by the works. The latter were tested as received. The cast bars were cut in two, part tested as received, part after heating to 900 deg. C. for half an hour

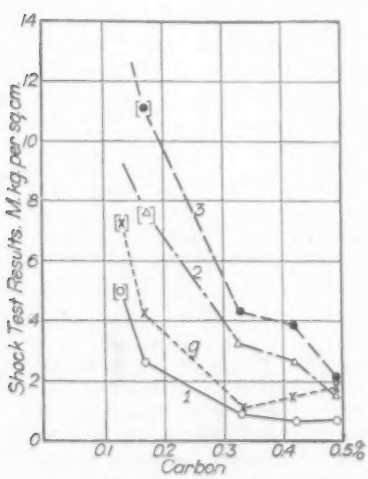


Fig. 3—Material K

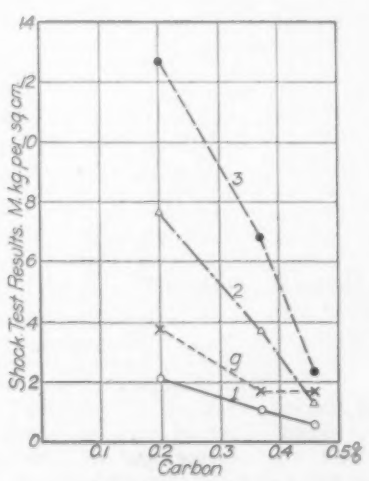


Fig. 4—Material G

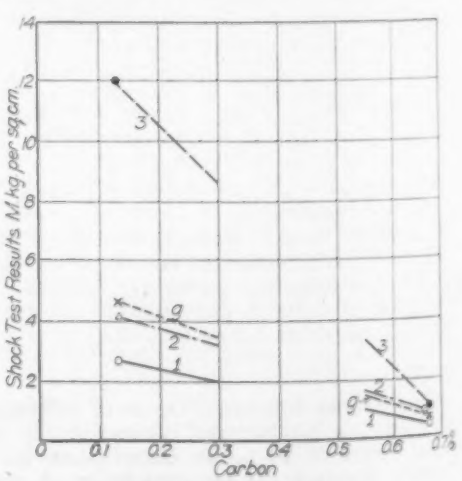


Fig. 5—Material B

RESULTS OF DYNAMIC TESTS ON STEEL FROM THREE GERMAN FOUNDRIES

and cooling in air (bars 10 x 12 mm.), and the rest after forging from 25 x 50 mm. to 15 x 15 mm., heating for half an hour at 900 deg. C. and cooling in air. The analyses are given in the table, and the results in Figs. 3, 4 and 5, where 1 is the steel as received, *g* as annealed by the works, 2 after heating at 900 deg. and 3 after forging and heating.

Analyses of Materials Tested from Three German Steel Foundries

Material	Carbon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Silicon, per cent.	Copper, per cent.
K1	0.13	0.040	0.023	0.68	0.35	0.020
K2	0.17	0.040	0.060	1.01	0.42	0.015
K3	0.33	0.034	0.067	0.80	0.33	0.031
K4	0.42	0.034	0.050	1.07	0.40	0.025
K5	0.49	0.036	0.059	1.32	0.35	0.045
G1	0.20	.....	0.040	0.92	0.19	.....
G2	0.37	.....	0.030	1.15	0.29	.....
G3	0.46	.....	0.060	1.43	0.24	.....
B1	0.13	0.05	0.054	0.66	0.08	0.009
B2	0.67	0.044	0.082	1.06	0.24	0.045

The diagrams clearly show that as the carbon rises the resistance to shock rapidly falls. The steel as cast gives the lowest result in all cases. Heating for half an hour at 900 deg. C., followed by cooling in air, increases the resistance of the steel considerably, the increase being greater in the case of the low carbon steels than those with high carbon. Forging gives a still further increase in resistance to shock. In comparing *g* and 2, the bars annealed in the works and those heated to 900 deg. C. and cooled in air, it must be remembered that the former were larger bars (50 x 50 mm. compared with 10 x 12 mm.) and that they were also cooled very slowly in the furnace to obviate shrinkage strains. The effect of the large size bars and the slow cooling has already been dealt with, and explains the better results obtained with the simple heating to 900 deg. C. and cooling in air.

The remainder of the paper discusses these results and applies them to the annealing of castings, forgings, etc. Quick cooling from 900 deg. C. gives the best results, at least for steels with less than 0.40 per cent. carbon. Such cooling, however, is dangerous for ordinary castings with parts of various thicknesses, as it introduces shrinkage strains. To get the best results, therefore, two conditions must be met that are apparently contradictory. It is very probable that in order to get the best resistance to shock the quick cooling should only extend below the pearlite transformation point, which is about 700 deg. C. or lower when quick cooling is used. Experiments have been made at the Royal Testing Laboratories, which indicate that slow cooling from 500-600 deg. C. completely frees the material from shrinkage strains, the metal being sufficiently plastic at this temperature. In order, therefore, to obtain at the same time high resistance to shock, and thoroughly remove all shrinkage strains the practice should be to heat uniformly at 900 deg. C. and cool moderately quickly to a temperature below the pearlite point. Then, as a second step, cool very slowly from this temperature to that of the air.

G. B. W.

The annual outing of the Business Men's Club of Cincinnati, Ohio, will be held at the Laughery Island Club, May 28. The entertainment committee announces that special arrangements have been made to make this the most enjoyable outing the club has ever held. A number of out-of-town machine tool builders and dealers are expected to attend.

The McMyler Interstate Company, Cleveland, Ohio, has shipped a 100-ton car dumper to Natal, South Africa, where it is to be installed at the Port of Laurenco Marques. It has also taken an order for a car dumper for shipment to Fraser & Chalmers, Durban, South Africa.

A Bench Jig and Die Filing Machine

The B. C. Ames Company, Waltham, Mass., has brought out a new bench filing machine. It is designed especially for work where perfectly straight and true surfaces have to be filed to an angle, the particular field for which it is intended being the cutting of dies and jigs and template work.

The machine does not use an ordinary stock file, but a special parallel one, which is supported at both ends like a jig saw. These files, which are 8 in. long, are used in the same way as a hacksaw blade. Among the various kinds that can be supplied are round, square, triangular, half-round, rectangular and wedge-shaped files. In this way it is possible to cut one, two, three or four sides; one or two edges and two sides and one edge, according to the style of file employed. The round and square files measure ¼ in., while the rectangular ones can be furnished in thicknesses of 1/16, ⅛ and ¼ in., and a common width of ½ in.

A New Bench Filing Machine for Use in Cutting Dies and Jigs and Template Work

If desired saws can also be used in place of files. The table, which is 9 in. in diameter, has a graduated adjustment, and the stroke can be varied from 2 to 5 in. The machine is designed to be installed on a bench so that the driving mechanism is underneath, with the table above at a hight of 18 in. The machine is driven by a three-step cone pulley and is furnished with a countershaft, the belt running down to the shaft under the bench, in which the machine is installed. The complete shipping weight of the machine, including the countershaft, is approximately 145 lb.

The United States Circuit Court of Appeals at Chicago May 16 ordered 24 labor leaders convicted in the structural-steel dynamiting cases to surrender June 6 to the warden of the Federal prison at Leavenworth, Kansas. Only a pardon from President Wilson can now save them from serving their sentences, which range from one to six years. The court took under advisement the cases of Olaf Tveitmoe of San Francisco, Richard H. Houlihan, of Chicago, and William Bernhardt of Cincinnati.

The Laclede Gas Company, St. Louis, has begun construction work on its new by-product coke plant, the first unit to be of 56 ovens. Each oven will hold 14 tons of coal. A gas holder of 1,000,000 cu. ft. will be erected and a water-pumping station, central power plant, ammonia tanks, machine shops, etc., will be included in the plant. The work is to be completed on the first unit June 1, 1915.

New Data on Electric Smelting in Sweden

More Recent Developments in Producing Pig Iron in the Electro-Metals Furnace — Steel Refining and Costs

In a paper contributed to the Canadian Engineer, Jens Orten-Boving, member of the Institute of Mechanical Engineers, London, England, gives important information not previously available regarding the manufacture of pig iron in electric furnaces in Sweden, where the industry has reached its most extensive development. A large portion of the paper follows:

During the last five years some very remarkable developments in the iron industry of Sweden have taken place by the introduction of electric reduction of iron ore, producing pig iron, and by electric refining of low-quality steel to high-grade steel. The system which has met with real commercial success is that of Electro-Metals, Limited. Other methods have been tried repeatedly but they have all been abandoned and today the Electro-Metal furnaces are the only ones in use in Sweden. The following is a list of Swedish furnaces:

	Number	Power per furnace	Total power consumed
Working now:			
Strömsnäs Jernwerks A. B.	1	3,000	3,000
Uddeholm A. B. Hagfors	3	3,400	10,200
Stora Kopparbergs Bergslag A. B. Domnarfvet	1	3,600	3,600
Building now:			
Strömsnäs Jernwerks A. B.	1	3,000	3,000
Nykroppa Jernwerk	2	3,400	6,800
	8		26,000 hp.

These furnaces will produce approximately 80,000 tons of pig iron per annum. The Stora Kopparbergs Company are putting down 10 more furnaces, not included in the above. There are, further, a great many installations contemplated and it is certain that wherever there is cheap water power the old blast furnaces will be replaced by electric producers. Generally speaking, it holds good that wherever one horsepower per annum can be produced cheaper than the cost of two tons of charcoal or coke (depending on what class of iron is to be produced) it is a commercially successful undertaking to substitute electric heat for carbon heat.

The operation of the electric reduction furnace is much simpler than that of a blast furnace, and everybody who has been visiting the Swedish works returns impressed by the extreme simplicity of the affair. Fewer hands are required as well as less skill than for a blast furnace. The prime costs for the electric plant are also lower.

Tables 1 and 2 give all the data required for calculating the cost of one ton of iron produced. For a plant of three furnaces of 3000 hp. capacity each the following staff and labor would be required: One chief engineer, one assistant, two chemists, three foremen, two electricians, 10 men in each of three shifts.

Table 1. Continuous Run of One Furnace Belonging to Strömsnäs Jernwerks A. B. from Oct. 1, 1912, to Sept. 1, 1913.

Number of charges	26,549
Weight of ore used, tons	11,338
Weight of limestone, tons	907
Weight of charcoal, tons	2,700
Produced pig iron, tons	7,258.8
Weight of charcoal used per ton of pig iron, lb.	830
Total number of hours when running normal, hr.	7,957
Total power consumed, kw.-hr.	15,291
Total power consumed per ton iron, kw.-hr.	2,107
Weight of pig iron produced per 1 hp. yr., tons	3.05
Weight of pig iron produced per 1 kw.-year, tons	4.14
Total consumption of electrodes, tons	28.42
Consumption of electrodes per ton of pig iron produced, lb.	8.7

DETAILS OF PRACTICE AT HAGFORS

At a meeting at Kristinehamn of the iron masters in the district last spring the following observations were made by the chief engineer of the Hagfors electric furnace plant after the first year's running:

The work with the foundations of our plant was commenced at the middle of April, 1911; eleven months later, or on March 15, 1912, furnace No. 1 was in operation, in August No. 2 was running, and now No. 3 is ready for starting up.

The plant was originally designed for two furnaces only of 3000 hp. capacity each (the power consumption is actually 3400 hp.). The furnaces are placed in the central bay; on one side all the electrical gear is placed, transformers, switches, regulators, etc., this part being entirely isolated from the metallurgical part. The power is generated 9½ miles away at Forshufvud, which power station belongs to the company. The voltage is 12,000 on the line and is reduced to low pressure by the transformers and adjusted by the regulators to between 50 and 100 volts as required.

The furnaces, as well as the whole of the plant, have been designed by the Electro-Metals Company and are mainly following the lines of the well-known Trollhattan furnaces, although the various details naturally show modifications based upon the experience from Trollhattan. There are six electrodes, cylindrical in shape and arranged to be used continuously without waste by screwing the ends together. The pouring bay

Table 2. Continuous Run of the Trolhattan Furnace for Three Three-Month Periods from Oct. 1, 1912, to June 30, 1913
(This furnace was run by the Swedish Association of Iron Masters with a view to establishing the practical success of the system as well as to give the various members an opportunity of trying their various kinds of ore. Thus, in the table below different kinds of ore were used during the period indicated.)

Period	Oct. 1, 1912, to Dec. 31, 1912	Jan. 1, 1913, to March 31, 1913	April 1, 1913, to June 30, 1913
Number of charges	6,193	7,107	7,281
Kiruna A ore, tons	1,047	223.3	799.8
Tuollavara ore, tons	973.4	123.3	762.6
Klacka-Lerberg ore, tons	885.6	1,453	1,426.5
Persberg ore, tons	8.82	47.97	148.4
Total ore, tons	2,914.8	3,047.6	3,137.4
Limestone, tons	169.94	252.8	273.5
Charcoal, tons	699	719	738
Pig iron produced, tons	1,905.86	1,933.32	2,000.14
Charcoal per ton pig iron, lb.	825	835	830
Actual working time, hr.	2,158.5	2,113.7	2,147
Consumed power, kw.-hr.	3,957,565	4,095,588	4,216,544
Consumed power per ton, units	2,076	2,118	2,108
Produced pig iron per kw.-year, tons	4.22	4.14	4.15
Produced pig iron per hp.-year, tons	3.10	3.04	3.05
Consumption of electrodes, total, tons	5.307	8.670	7.896
Consumption of electrodes per ton, lb.	6.2	10.0	8.8

Note—The ore from Kiruna and Tuollavara is of the highest quality obtainable in Sweden. It will be seen that the output of the furnace as well as the consumption of electrodes depends largely on the quality of the ore used.

is conveniently fitted with an electric overhead traveler as well as trolley tracks for transporting iron and slag. The iron can either be poured to pig or conveyed in ladles to the Bessemer and open-hearth works. The slag is run into block molds and makes excellent building stone.

The crushing room is at the end of the furnace building. There are three crushers of the ordinary jaw type. There is a railway track outside and the daily requirements are supplied in the trucks so that there is no need for big storing bins. One of the crushers is fairly large with wide enough jaw space for the biggest lumps, and the ore passes from the crusher to the smaller ones, and thence by a bucket elevator up to a belt conveyer above the charging platform so that the raw material may be unloaded where required. There is a small ore store, but this only contains some limited reserve amounts of the various kinds of ores used. These are from Taberg, Finnmossen and Nordmark. The charcoal is transported from the stores by a ropeway.

KINDS OF PIG IRON PRODUCED

Up to now three different kinds of pig iron have been produced: For open-hearth treatment; for Lancashire treatment; for Bessemer treatment.

The quality which is desired for the open-hearth pig is semi-spiegel and contains Si, 0.40-0.60 per cent.; Mn, 0.30-0.50 per cent.; P., 0.011-0.018 per cent.; S., 0.015 per cent. It will be seen later on that it is more economical to produce pure spiegel iron in the electric furnace, and arrangements are being made to alter the open-hearth furnaces so as to use spiegel iron only. It has been assumed in various quarters that it would probably be difficult to maintain a constant product in an electric furnace. Experience shows, on the contrary, that a much more constant product is obtained from the electric furnace than from our old blast furnaces. One of the reasons for this fact is that there is such a large receiver or collecting basin in the lower part of the electric furnace that this collector acts as a regulator on the quality.

The Lancashire pig needed is quite white and has the following analysis: Si, 0.20-0.30 per cent.; Mn, 0.20-0.30 per cent.; P., 0.011-0.018 per cent.; S., 0.015-0.020 per cent. In the beginning there was a tendency for the sulphur to be unduly high, but this was put right by making the slag more basic whenever the furnace was run for Lancashire pig.

The analysis of the quality of Bessemer pig used is: Si, 1.00-1.40 per cent.; Mn, 2.50-3.00 per cent.; P., 0.015-0.019 per cent.; S., 0.005 per cent. Excellent Bessemer has repeatedly been made of this pig. At first the result was not good, but it was soon found that we had to increase silicon and manganese. It had been assumed that the amount ought to be as usual, but the reason for the higher content being required is probably that the temperature of the electro-Bessemer pig is lower than for ordinary Bessemer pig from blast furnaces.

We intend, however, to rearrange the receiver in our electric furnace with a view to increasing the temperature. Our general experience points to the following results: It is cheaper to make spiegel than gray pig because: 1. More current can be put through the furnace. 2. The current consumption is lower. 3. Thus the production is higher. 4. The electrode consumption is lower. 5. The repair costs are lower.

It may further be stated that rich charges give better results than poorer. The quality of the pig is not influenced by the percentage of iron contents of the ore. The electrode consumption has been relatively high and this is influenced by the following conditions: 1. High power consumption (which, of course, increases if the charges are poor). 2. Too lively gas circulation and too large a proportion of CO_2 in the gas. (Of course the carbon consumption is correspondingly lower). 3. Too large electrodes for the load. Since the 15th of January we have used the gas from the furnaces as fuel under our open-hearth furnaces and I estimate the value of the gas at from 2 to 3 shillings per ton of pig iron produced.

Finally, regarding the influence of the electric pig on the finished steel, our experience shows that the change tends to make better steel; this holds good both for Bessemer as well as soft and hard open-hearth steel.

The steel produced at Hagfors is of the highest quality and is mainly used for locomotive boiler tubes, piano wires and high-tension wires generally. Practically the whole of the output is exported.

In Sweden generally the electric reduction of iron ore is regarded as revolutionizing in this industry and elaborate preparations are being made for constructing mills of considerable capacity. Recent experiences have shown that larger electrodes can be used at the same time as the current intensity on the electrodes is increased. Larger furnaces will therefore be designed and some of those now projected will have a capacity of 8000 hp. each.

It has been found that when using coke instead of charcoal it is advantageous to run on burnt lime, as otherwise the power consumption is too high, which largely depends on too much CO_2 being produced.

THE REFINING FURNACE FOR STEEL

The Electro-Metals refining furnace is designed for 2-phase current, although 3-phase may be used by suitable design of the transformers and coupling the connections on Scott's system. The furnace has been correctly and carefully described in the July 25, 1913, number of the Electrical Review. A number of these furnaces are now in operation in Sweden and in Sheffield, England, and the working results are highly satisfactory. To run this type of refining furnace is extremely simple, everything being so well arranged and balanced that any steel melter who knows open-hearth work can take charge of the electric furnace. No special training or skill is required from an electrical point of view.

These furnaces give a marvelous product inasmuch as it is quite easy to produce a high-class steel from any ordinary scrap with the greatest ease. The ordinary steel melter used to open-hearth work will not believe the results in the beginning, but once he has familiarized himself with the proper use of various slags to remove sulphur and phosphorus, as well as how to determine the carbon content or to add alloys, he will be loath to return to the open-hearth furnace which, indeed, is a very clumsy and incomplete apparatus compared with the electric refining furnace.

The process is equally suitable for high and low grade steel, for castings, drills, tool and quality steel of every kind and use.

The following figures, taken from an article published in the Electrical Review of July 25, give the actual costs of production:

Working costs per ton steel

	£	s.	d.
Electrode consumption	0	4	0
Lining, roof, felting	0	6	0
Slag materials	0	2	6
Labor (assuming auto-regulation)	0	6	0
Tools	0	1	0
Electric energy, 825 kw.-hr. at .6d.	2	1	3
	3	0	9

These are actual figures taken from the works cost sheets and are obtained from a furnace of 2½ tons capacity, so, naturally the figures are considerably reduced in larger furnaces.

It should also be noted that a very high rate is paid for the electric energy, as this is obtained from the municipal supply and is generated by steam. In utilizing water power, the current could easily be supplied at 0.2d. per kw.-hr., corresponding to a charge of £6 per horsepower-year based on

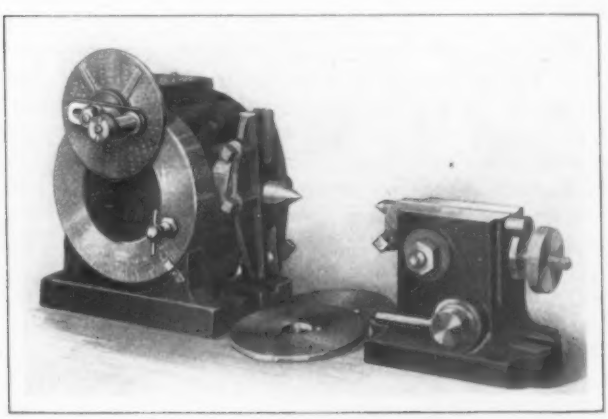
300 days a year continuous full load; consequently, in using the above figures as a base to figure out cost of production in Canada it must be borne in mind that although the cost of labor would be undoubtedly higher, the cost of electric energy would be only one-third and the total cost, as shown by the above figures, would be in the neighborhood of £2 per ton.

If a new iron works were planned, electric reducing and refining should be used throughout and it is certain that with judicious arrangements adapted to the special requirements of the country such an undertaking would pay handsomely and the quality obtained would be so high that it would exclude the importation of a good many standard products of iron and steel.

Ten-In. Milling Machine Index Centers

A new dividing head, somewhat original in design and simple in construction, has been brought out by Fred C. Dickow, 33 South Desplaines street, Chicago, Ill. The index plates divide all numbers up to 50 and all even numbers to 100, and all divisions up to 360 that can be obtained are given on the index chart.

The head and tailstock centers, which are made of hardened and ground tool steel, can mount work 10 in. in diameter between them. A clamping device is provided for locking the spindle during the cutting operation, and is relied upon to relieve the worm, wormwheel and index pin from strain. There is a No. 10 Brown & Sharpe taper hole through the spindle, which is also threaded at the front end. Adjustments to compensate for wear are provided. Graduations on the swivel block enable it to be set at any angle from 10 degrees below the horizontal to 10 degrees beyond the perpendicular, and a rigid and durable clamp is relied upon to keep it firmly in place at the desired angle. The wormwheel is over 5 in. in diameter, and, together with the worm, can be easily adjusted to compensate for wear. If desired the tailstock center can be raised vertically



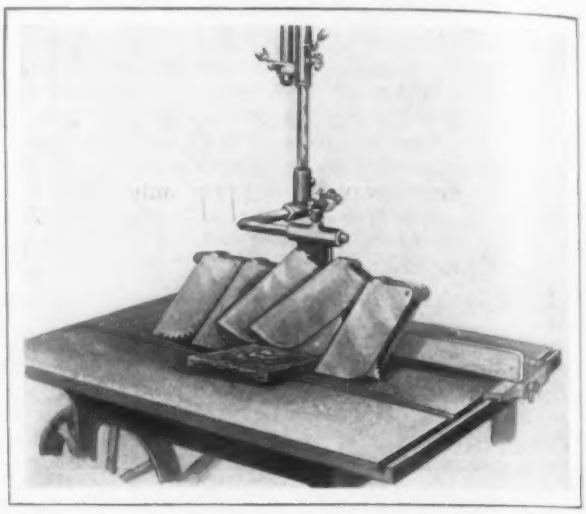
A New Universal Dividing Head for Milling Machines

and set at an angle in a vertical plane by loosening the clamping bolt and raising the lever. Four ⅝-in. shoes are fitted to the head and tailstocks for use in connection with the standard slots in milling machines, and special sizes of shoes can be furnished, if desired.

The Portsmouth Steel Company, Portsmouth, Ohio, publishes a monthly booklet entitled "Safety Hints," which it distributes among its employees. In the May issue reference is made to a new 112-page book of "Rules and Regulations for Safety" prepared by the safety committee of the Whitaker-Glessner Company, a related company. A copy of this goes to each employee.

Self-Adjusting Guard for Circular Saws

A circular saw guard, shown in the accompanying engraving, has been developed by L. F. Grammes & Sons, Allentown, Pa. It consists of a number of blades suspended from a right angle piece of stock, which in turn is suspended from the



A Self-Adjusting Safety Guard for Circular Saws Designed for Suspension from the Ceiling

ceiling. The bracket from which the blades are suspended will not vibrate, it is found, and the position of the blades of the guard can be varied in two directions with relation to the point of suspension, as well as being adjustable for hight.

The guard has the advantage of the spreader found in other types, but in this case it is from the top, so that the saw table may be a tilting one. The guard serves also to prevent pieces of stock from getting into the path of the saw teeth, to be marred or thrown about, and the rear pair of blades have a number of radial spurs arranged so that one or the other will engage the stock being cut and prevent it from coming back.

There are a series of holes drilled in the blades around and near the socket, from which they radiate. The purpose of these is to permit pins or nails to be inserted and prevent the blade from dropping, thus permitting stock to be withdrawn if partial ripping is desired. The rise and fall feature is also present, but it is pointed out that the weight of the hood is not lifted by the stock passing underneath. The hood is simply a set of light steel blades, suspended from a rigid bar over the saw, which are inclined backward and merely feather over the stock while it passes through and drop to their normal position behind it.

The Transue & Williams Company, Alliance, Ohio, will shortly have completed important extensions to its plant. These include an enlargement of the forge shop, the installation of 22 new hammers and a number of presses, the addition of 1100-hp. boiler capacity, the installation of another low-pressure turbine and the erection of a pulverizing plant for the fuel supply. As a result of the improvements the capacity of the plant will be doubled.

The Alton Steel Company, Alton, Ill., which began operations recently, manufacturing steel hoops and bands, has completed some refinancing operations and has filed a mortgage to cover a bond issue of $350,000. The capital stock will be increased from $600,000 to $950,000. The refinancing is announced to have been made necessary by increased business.

CASTINGS FOR SPECIFIC NEEDS

The Fields for Iron and for Steel—Hammer and Drop Forgings

In a paper on the properties, treatment and selection of iron and steel for engineering purposes, read recently before the Cleveland Engineering Society, James H. Herron, metallurgical engineer, Cleveland, had the following to say on the selection of material for castings:

In castings that are only subjected to a condition of static loading, and where no limits of space or weight are prescribed, iron castings answer the purpose in every way. They not only offer the easiest problem in castings but are subject to less shrinkage and are much easier to machine than castings made from other material. For this reason iron castings are satisfactory to use in machine parts and form the bulk of such castings. There are, of course, conditions of loading where it is not one of static condition but in a measure dynamic, as in the steam engine, but the rate of change in the stress is uniform and the reversal of stress takes place in an appreciable length of time so that it may be considered perfectly feasible to use castings of this character if a unit stress is selected sufficiently low. Steam engine builders allow a very low unit stress on all cast iron. In machine design unit stresses allowed are inversely proportioned to the service expected. Many designers do not exceed a unit stress of 2000 lb. for ordinary conditions, assuming that the requirement varies from zero to a maximum minus. Owing to the high value positively of cast iron, the compressive stress is usually regarded as negligible. In steam cylinders or other containers for an elastic fluid, the unit stress is often as low as 400 lb. As a rule castings are subjected to a stress as above given, i. e., from zero to a maximum plus or minus. This condition of loading has not in the past been considered one of dynamic character, but it is, nevertheless. Engineers while not generally recognizing such condition allowed for it in the low unit stresses assumed.

Generally in iron castings it is well to follow reliable specifications as those adopted by the American Society for Testing Materials. If special results are desired, compositions may be selected to meet the need. Also selective chill may be resorted to for various degrees of hardness.

Where a greater strength is required than in cast iron, the semi-steel casting can be resorted to and seems to give satisfactory results. There is a question whether semi-steel castings can be depended upon to show a consistent ductility. There are tests of these castings which show an appreciable elongation, although there is no way from the test or analysis of ascertaining the proportion of steel entering into the mixture.

MALLEABLE AND STEEL CASTINGS

Where still additional strength is required and a considerable toughness, the malleable casting offers an excellent solution, especially where the castings are small. The malleable casting should not be confused in value with steel forgings, as the only part that is at all ductile is the outside skin. Malleable castings are of about twice the value of gray iron castings.

Where combined strength and ductility are required, the steel casting is the only form that can be used where a cast shape is necessary. One of the great objections to steel castings is the danger of superficial blow-holes, so that where a clean finished surface is required it is well to substitute some other form of casting, unless sufficient confidence can be placed in the foundryman to furnish the proper material. There is no question that castings can be made free from blow-holes if proper precaution is taken, and it has been my personal observation that both vanadium and titanium treated steel have been in every way satisfactory for castings. Not only has the steel been free from blow holes, but it has been rendered much denser by the expulsion of the occluded gases.

In this connection it might be well to consider the subject of the proper design of castings and give a few principles which may not be generally understood. Castings should, if possible, be of uniform cross-section with the corners well rounded and generous fillets in the angles. This is especially in steel castings where the shrinkage is large. When iron and steel solidifies, the crystals forming tend to set themselves normal to the surface, consequently, when the corners are square, a plane of weakness is formed, the plane by-secting the angle at the corner.

FORGINGS

The value of the hammer forging is in the mechanical refining which takes place throughout the entire mass due to the equal hammering of the forging. In the drop forging the hammer tends to hammer one part of the forging much greater than other parts, resulting in unequal stresses which tend to either weaken the material or cause a subsequent distortion. With the proper heat treatment a drop forging will be of equal value to the hammer forging provided it has had care in heating for the forging operation. Unfortunately, there is a tendency to overheat the steel to have it conform readily to the shape of the die and to reduce the work involved in forging to a minimum. This is of course a great mistake and constitutes the chief objection to drop forgings. There is one point in drop forgings that should not be overlooked, namely, that all drop forgings subjected to any very considerable stress should be either annealed or heat treated before use. This is very imperative with gears where they are to be subsequently hardened or tempered and should be done prior to the machining operation, so that the distortion resulting from the annealing operation may be machined out.

A Boltless Rail Joint

The Continental Railway Supply & Equipment Company, 420 Ashland Block, Chicago, has been incorporated with a capital stock of $300,000 to manufacture the Allen interlocking rail joint and other railroad devices. The president of the company is Thomas P. McDonough, a widely known railroad construction engineer and builder who will devote all his time and attention to the interests of the company. The vice-president, Joseph P. Williams, is now connected with the Braeburn Steel Company in Chicago. The secretary and treasurer is Oglesby Allen, Jr., who is the inventor of the rail joint to be manufactured by the company. Mr. Allen is an inventor of other railroad appliances, notably a nut lock now being used on many important systems. He is further perfecting a number of other railroad appliances and devices which will be handled by the company. The rail joint referred to is a boltless joint which supports the rail and holds it securely in position. The claim is made that this joint will avoid the cost of labor and material in the continual renewal of bolts, nuts and lock washers.

Recent reports indicate increased operations at the plant of the Dominion Iron & Steel Company, Sydney, Nova Scotia, calling for the blowing in of an additional blast furnace.

Determination of Economies in Handling*

A Method of Classifying and Estimating Fixed and Variable Charges to Ascertain the Justifiable Investment in Factory Carriers

BY W. F. HUNT, M. E.†

Unnecessarily high costs of handling are frequently due to not recognizing the aggregate amount of, and in not securing the savings that can be made from, the many relatively small economies possible in the handling of the material in the numerous transfers that make up to the total cost. The analysis of any problem is but the application of fundamental principles to any situation whether in a small mill or in a group of extensive mill buildings.

The object of this paper is to call attention to the possible savings in the handling of material, to the commercial apparatus available to secure them, and briefly to indicate a simple method of examination that will help the manager in determining:

1. Where he can save in handling.
2. How much he can reduce the labor costs at these points.
3. What investment will be remunerative.
4. Will these changes pay, and are they in line with future development of the plant.
5. What commercial apparatus is best to accomplish the results in any particular case.

There can be no hard and fast rules for work of this kind. It requires an intimate knowledge of apparatus available, a careful collecting of the facts of operation, and the exercise of good judgment and creative imagination to see the arrangement of apparatus that will effect the desired results, and at the same time fit in with the existing conditions of operation. The writer herein outlines a method that he has found helpful in marshalling the facts for his decision and recommendations. Conditions will vary and all the details can not be foreseen or discussed in a paper of this kind.

WHERE CAN EXPENSES BE REDUCED

Usually wherever more than one man is employed in the transfer of material from one point to another, and wherever the physical effort is greater than one man can perform, expenses can be reduced. Conservation here means reduction of the human physical effort—doing the work with a cheap power and utilizing the man's intelligence to direct the application of this power to his full supervising ability. Where these conditions exist and commercial apparatus is available to do the work further study is justified. It may pay to install apparatus and it may not, depending on (a) constant or intermittent work, (b) the character of the operation itself, and (c) the results of the following analysis. If the conditions described can be improved by the use of commercial apparatus, we can determine how much labor will be required by the proposed method, and the probable labor saving effected. Assuming we have planned a good working arrangement of commercial machinery to do the work, we can readily estimate the cost of the necessary apparatus. This will, of course, depend on the plans suggested and the needs of the situation, and can have no definite discussion here. To what extent investment is justifiable to effect the saving is the item in the investigation that is the most difficult of analysis, as it has so many variables. The figures obtained by the following method are only an indication of facts and the ultimate decision must be dictated by good judgment and a general consideration of the whole situation.

The variables are many in the work to be performed—the work may be of temporary character, infrequently done, the amount fluctuating widely, or it may be a regular daily operation year in and year out. This item varies from 0 to 100 per cent. If of a temporary nature, no saving can be made, whereas if of daily need for the future, the whole saving of the reduced labor by the plan suggested is available. The true value exists somewhere between these two extremes. It need not be difficult to assign a value to this item after thorough observation and careful consideration. Let us call it X—a percentum.

CLASSIFICATION OF ITEMS TO BE CONSIDERED

The variables in the investment value may be classed as follows:

Interest charges on investment—A per cent.

Interest to provide for upkeep of apparatus installed—B per cent.

Interest to provide for depreciation due to age—C per cent.

Interest to provide for progress in the art of the particular device proposed (i. e., subsequent inventions)—D per cent.

Interest to provide for extension to service—E per cent.

Additional superintendence and overhead expenses due to change in method—H per cent.

Cost of power, supplies and other variable items in dollars per year—F.

These eight items comprise the necessary charges that must be considered, and each of them can be approximately determined by one familiar with the apparatus selected and the operating conditions. While in any particular case any of them may vary, the total can be determined with approximate accuracy.

We now have the elements of a test formula which determine the amount of profitable investment:

METHOD OF FIXING PROFITABLE INVESTMENT

Assume as a test case four men are employed day in and day out in moving coal, lumber, cotton, or any other material from one point to another. And assume that a commercial apparatus (electric truck, narrow gauge railroad, conveyor, etc.) will do all the work of these four men with one operator.

Assume we pay the men $2 per day each for 300 days per year:

Labor reduced $1800 per year.
Assume X = 80 per cent. Plant operated 1 shift, the men employed 80 per cent. of the year.
A = 6 per cent. Interest on investment.
B = 6 per cent. Upkeep.
C = 15 per cent. Depreciation.
D = 10 per cent. Anticipating more economical machinery for same purpose in the future.
E = 3 per cent. Extension to service.
H = 3 per cent. Additional supervision required.
F = $400 cost of power, etc., per year.

$$\frac{\$1800 \times 80 \text{ per cent.} - F}{(6+6+15+10+3+) \text{ per cent.}} = Z$$

$$\frac{\$1440 - \$400 = \$1040}{43 \text{ per cent.}} = \$2420 = Z$$

*From a paper read before the National Association of Cotton Manufacturers, Boston, Mass., April 29, 1914.

†Consulting engineer, New York.

Let S = the yearly saving in labor in dollars and Z = the investment in dollars justified by these considerations, then

$$\frac{S\ (X \text{ per cent.}) - F}{(A+B+C+D+E+H) \text{ per cent.}} = Z$$

The examples are not intended to represent any typical instance as to conditions of operation or values selected for the variables, but merely to make clear to the eye the method employed.

Our investigation indicates that an apparatus costing less than $2420 can be installed that will be kept in good condition—earn interest on investment and provide reserves for depreciation, obsoleteness, etc., and show a saving. If the apparatus (assume an electrical storage battery industrial truck) will cost to install I = $1750—the expense charge will be:

I (A+B+C+D+E+H) per cent. + F or
$1750 × 43 per cent. = $752.
$752 + power (F $400) = $1152.
Labor saving = S = $1800 — $1152 = $648.

An actual saving of $648 per year—a return of 36 per cent. on the investment—over and above all interest charges, upkeep, deterioration and obsoleteness.

It follows from the relation of the equation that it provides yearly:

A = 6 per cent. interest on the investment.
B = 6 per cent. for repairs and upkeep.
E = 3 per cent. for minor extensions and equipment.
H = 3 per cent. additional superintendence.
F = $400 cost of power, etc.

It is seen, further, that in four years there is created, in addition to the above, a reserve equal to the whole original investment for a renewal of the apparatus, or the purchase of a new device that is more economical in use.

METHOD PRACTICABLE AND REASONABLY ACCURATE

The writer finds the above method, a simple workable one that tells with reasonable accuracy the savings by the methods proposed, the risk of the investment and the provisions made for the future, and enables him to see the situation with increased clearness. In other words, it is comparatively easy to decide whether or not to proceed with any plan—if the following facts are clear: The total cost of the investment required, when it earns a fixed interest on the investment, providing a fixed amount for upkeep, for extensions, for the power used, creates a fund that will write off the whole investment in $\frac{100}{C+D}$ years, and a probable saving over and above the foregoing of a definite percentage on the original investment. To the writer's mind the method described does make clear the above facts and is therefore a useful tool.

OTHER POINTS INVOLVED IN REACHING A DECISION

Having determined the probable saving, the questions as to whether the proposed changes are in line with the future development of the plant and whether the money can be used to better advantage elsewhere can be considered in detail where the particular needs of the plant are known, and then only by the manager. The plan proposed must be subservient to the general organization and does not permit of discussion here. A wise conclusion as to the best layout and as to the apparatus most suitable can only be made by one intimately familiar with the various apparatus, their limitations, effectiveness and suitability to the work in hand. There are so many types manufactured, each of which has advantages of its own and a limited area of economical application determining its use or rejection for any given condition, that an opportunity for the exercise of judgment is always present. The general arrangement of the plant, the type of apparatus, the manufactured product which is most acceptable and economical when first cost, area required, upkeep and operating charges are considered, are matters for careful consideration.

Sand Drying Stove for the Foundry

For use in places where quantities of sand have to be dried, as in foundries, industrial plants, railroad stores, etc., the Indiana Foundry Company, Indiana, Pa., has developed a sand dryer, shown in the accompanying illustration. It has an upright cast-iron grating which surrounds the main heat-emitting body to prevent the wet sand from coming into immediate contact with the hot surfaces of the furnace. The grating, which is made in eight sections, is intended to serve also to prevent baking of the sand and consequently burning the castings. There is an open air space of approximately 1½ in. between the grating and the main body of the stove. The wet sand is shoveled into the skirting and rests against the grating. As it dries it runs through the grating into the hot air space, and then out through the perforated ring upon which the skirting rests. This arrangement, it is found, allows the wet sand to dry more rapidly than when it comes into immediate contact with the hot stove.

A Sand Drying Stove for Use in Foundries and Industrial Plants Having a Cast-Iron Grating Around the Main Portion to Keep the Wet Sand from Coming in Contact with the Heated Portion

During the hearings of labor problems before the United States Commission on Industrial Relations, which began in New York May 18, and are to continue four weeks, the commission will submit for the criticism of expert witnesses a draft of a bill creating a national board of conciliation and mediation to deal with all strikes and lockouts in any part of the country that seem likely to involve the Federal Government. The measure avoids all conflict over any question of State or interstate jurisdiction by providing strictly for voluntary conciliation, and expressly denies to the board any compulsory powers of arbitration or prohibition of strikes or lockouts. The bill plans co-operation with State boards of mediation, whenever such exist, and the joining with such boards in any section of the country for united action whenever a dispute extends beyond the limits of a single State.

The Canfield Gas Engine Company, a new incorporation, has purchased of P. B. Canfield the Canfield Foundry & Machinery Works, Binghamton, N. Y., and will remodel the plant for the most efficient production. The company has bought all of Mr. Canfield's patents and shop rights and will continue to make Superior and Canfield portable and stationary engines, together with all other kinds of machinery and appliances that naturally go with and are used in connection with gas engines. The company is composed of William J. Newing, Elmer L. Whitlock and A. Louis Newing. William J. Newing is a large contractor and builder. Mr. Whitlock for the past 10 years has been head foreman for the Stow Mfg. Company, Binghamton, and A. Louis Newing was cashier for the same company.

Furnace Injections to Prevent Hangings

The Introduction of Steam, Gases or Water Into a Blast Furnace—The Blast Furnace as a Gas Producer

BY F. L. GRAMMER

Three papers on the cleansing of furnace gas from mechanical impurities so as to improve their value for heat and power, have recently been presented, one by W. A. Forbes before the October meeting of the American Institute of Mining Engineers, and one by A. N. Diehl at the February meeting of the same society. Mr. Freyn, from the standpoint of a by-product coke-oven man in a paper before the same society in February and printed in *The Iron Age*, February 26, 1914, discussed the composition of such gases chemically. He compared them to coke-oven gas, discussed separate spheres of service, advantages of gas mixture and the close resemblance to such a mixture of Brassert's slag-producer gas made on ore-less furnace mixtures and non-carbonate flux.

The subjects are of interest in both phases. Their importance has been emphasized in papers by the author before the American Institute of Mining Engineers in 1903 on "Flue Dust and Top Pressures," "Sulphur in Gaseous Fuel" and "A Decade of Blast Furnace Progress." Two ideas are suggested by these recent papers. The first is concerned with the lessening of material carried away from the top of the furnace. I do not refer to constant entrainment by escaping gas. The remedies for this loss have been elsewhere discussed, but I mean the occasional very heavy loss through slips. Top slips are heaviest after longest hanging, partial or complete. If we can stop or shorten the hanging we can reduce the slip. This means reducing the loss of coke, ore and stone as well as increased safety to persons passing underneath; it also means fewer broken castings at the furnace top.

FACTORS IN CAUSING HANGINGS

Let us consider the factors we believe favorable to top ore hanging in an iron blast furnace. They are:

Straight stack; represent its angle with plumb line by	A
Narrow stack; represent its diameter by	D
Fineness of ore particles; call the number to an inch	N
Softness of ore particles; call hardness by	H
Richness of ore particles; call the units of iron	U
High tension of gas; represented by	t
Thick zone of carbon deposition—chiefly governed by temperature and gas composition and furnace hight.	Z
Slow descent of charge, velocity in inches per min	V
Vertical thickness of ore charge, represented by	C
Gas pressure due to velocity of rising gas at zone of carbon deposition	P

There are other obvious influences such as the method of distribution of stock and specific gravity of fuel and ore. The above listed ones are the customary factors and will be considered exclusively.

These influences may be put into a mathematical expression which will enable one to form a reasonable expectation and possibly a curve. Calling T the tendency to hang, then T varies directly and inversely as follows:

$$T = \frac{NUtPCZ}{HVAD}$$

Of these influences the most potent seem to be N, H, A, and then P, Z, C, and possibly t. These latter are more flexible and more susceptible to change than the first three.

It is generally recognized that sustained hangings do not often occur on furnaces using coarse ore or even on magnetic concentrates unless very finely ground. Hangings occur less on short furnaces and this is explained by the fact that such furnaces usually possess more tapered stacks, offering less foothold for arch or dome to spring from. Also such furnaces naturally have shallower zones of carbon deposition than the latter furnaces where graduations of temperature occur through greater hight.

We all know that carbon deposition is less marked on magnetic ores; it is also less marked on manganese ores. One can easily appreciate that the finer the ore the more surfaces there are offered on which the gas may react in this zone of change. It also holds that the finer the ore the smaller the interstices, and the more the carbon deposited fills such space, more completely binding the mass. A rich ore offers more iron than a lean one and so favors deposition. Smaller particles of ore increase the resistance to the passage of the blast and are themselves supported more by the rising gases, as in a jig. Tension of gas incident to back pressure tends to force gas around more particles of ore and so favors reaction. There are analogies in other chemical processes to warrant the reasonableness of the belief that high tension of gas accelerates carbon deposition from gas.

THE PREVENTION OF HANGINGS

Among recognized cures for these evils is first slackening of the blast. This reduces the buoying effect of rising gases and the weight of stock moves the mass downward. Cold wind, by altering zones of heat and reaction and also by contraction, assists somewhat at times but not so markedly as cold wind applied to cure a bosh hanging. Gas tension is reduced by cleansing flues and gas outlets, or making passage areas greater.

The furnaceman may modify the size of the charge somewhat. I have known the doubling of the size of a charge to increase blast pressure by 50 per cent. and more. These moves, however, have drawbacks. It is not always desirable to lower the temperature of the blast, and reducing wind volume decreases the output if it does nothing worse.

In routine operations these represent the ordinary gamut of controls. The ore has to be used as it comes from the stock pile. An excessively fine portion being put in the bins, combined with the furnace driving slowly, is likely to be followed by a period of hanging, slips or spitting at the top. Hanging reveals itself before the slip by blast pressure—stock gauge measurement or through records—or by the appearance of the gas at the stove or boiler burners and possibly by changes in gas composition revealed in composimeters such as Uehlings, etc.

INJECTION OF STEAM, GASES OR WATER

However these explanations may be regarded, it is certainly true that the influences which affect the blast pressure and temperature and composition of rising gases at the zone of congestion will

modify the strength of the arch. I therefore propose that furnace stacks should be equipped with devices to introduce steam, other gases or water, say 15 to 25 ft. below the stock line.

The action of these injections might be explosions in the case of water, or chilling in the case of gas or steam; but, if they occur below or at the side of the congestion, they should break the dome and re-establish the downward movement. The valve controlling should be accessible to men at the furnace front.

So far as I can learn this is a new idea and should prove of benefit in saving heat in ejected material as well as otherwise. Steam injection has, however, been tried at the tuyeres for bottom hangs, operating either through pressure or chilling. I am informed that at certain Ohio furnaces this has been found efficacious in urgent need.

THE FURNACE AS A GAS PRODUCER

The second matter on which I started out to comment is suggested by what is said in Mr. Freyn's paper, referred to above, concerning slag gas, or furnace producer gas. The slag from open-hearth furnaces is very basic. It acts as a blanket to keep down heat and also fluxes coke ash without adding CO_2 to the escaping gas from the furnace top.

Details of the process are not given but the chief ideas seem to have been to reduce CO_2 and employ an idle furnace in dull iron markets to make gas, helping directly or indirectly with local gas contracts. But such a device does not reduce nitrogen. Hydrogen may be objectionable in gas intended for certain engines, but its fuel value is beyond question. It occurs to the writer that better gas than slag gas or the mixture of furnace gas and coke-oven gas may be more advantageously produced in some centers as follows:

INJECTIONS THROUGH TUYERES

1. The ground carbonate flux (or screenings) may be projected into the tuyeres, as it is needed by the ash made by coke combustion. The CO_2 expelled is thus changed into CO and by burning coke by CO_2 instead of air the additional advantage of decreased nitrogen in gas results. This keeps furnace temperatures down and means but little slag to handle, uses up limestone screenings and makes clean gas.

2. If hydrogen is not a drawback for the service in view, steam may often advantageously be introduced at or near the tuyeres. This not only reduces nitrogen but enhances the heat value of gas through the hydrogen introduced.

3. The downcomer dust with its 6 to 12 per cent. coke may sometimes be advantageously injected into the hearth through the tuyeres by blast. It is true all prior canons have insisted that economy demands that oxygen be removed by gas rather than solid fuel.

COMMENT ON THESE RADICAL DEPARTURES

The first of these suggestions may be easily put into effect without much thought as to heat demands. Indeed, a furnace on ordinary mixtures of ore, using coke and having a market for gas can afford to experiment in part on this line so far as a flux for the ash of the coke is concerned. It must be remembered that the slag at the bosh top has a very heavy basic composition, the silica increasing in the crucible 7 or 8 per cent. as the ash is released from the coke. Such slags are very infusible and this occurs at a sticking point in the furnace. This constitutes a very fundamental difference between charcoal and coke smelting. The former slag is practically complete when made and its slight ash addition in crucible increases basicity.

In smelting ores it might be advisable first to calcine the stone projected into the tuyeres—or even to renew early attempts at calcining stone charged at the top for ore flux. As to the amount of steam to be put into the furnace bosh or crucible to make water gas—this is limited by the use to which the gas is put and by the heat available.

The ground is somewhat new. We have a hot blast and the coke is thoroughly pre-heated in descent. In water gas processes the air is not heated and the coke but slightly preheated. In our furnace we burn to CO and use all the gas. In water gas during "blasting" they aim to produce CO_2 and nitrogen solely, and the hot gas is thrown away. During "blasting" the producers are arranged in parallel; during steaming, in series. During this latter period the product is CO and hydrogen compounds and no nitrogen. The theoretical possibilities and the actual attainments are so far apart in water gas producers. We have assumed that the heat available will permit 20 per cent. carbon content to burn to CO through steam decomposition.

As regards the amount of downcomer dirt we can use in our gas furnace at the tuyeres, we are also on new ground. The primitive processes of solid fuel reduction employed several centuries ago and the latest electric smelter do not tell very much. It is a problem to be approximated very gradually. This opens up the question whether low fuel smelting records will be as much of a goal as formerly. Our creed may be altered if gas becomes marketable in large centers of population.

THEORETICAL YIELD OF GASES

Disregarding the volatile matter expelled from coke, consisting of several per cent., chiefly hydrocarbons, which explains our variation from the analyses (by volume) quoted by Mr. Freyn, we have the gas by weights show:

	Coke combustion by air; limestone flux put in the furnace top	Coke combustion by air and 20 per cent. by steam	Coke combustion by air and flux; carbonate injected at tuyeres
Inert gases			
Carbon dioxide	1.6	1.7	....
Nitrogen	64.1	58.4	63.8
Fuels			
Carbon monoxide	34.3	39.4	36.2
Hydrogen	....	0.5	....

The use of ore at the tuyeres would resemble the second column without hydrogen. When we consider that the heating value of hydrogen is about fifteen times that of CO we can see we have considerably improved the heat value of the gas.

Putting in the volatile matter from the coke the last column should equal 127 B.t.u. Ordinary furnace gas could easily be raised to 105 B.t.u., I should judge, by reducing the CO_2 by one of these methods.

In an article such as this the possibilities are too numerous to elaborate at length.

An electric Diesel-engine railroad motor car was tested in southern Sweden last January. It weighs 33 tons and was run at a speed of 34 miles per hour on level track, and at about 20 miles an hour on a grade of 1 in 100. Altogether 2200 miles were covered. The consumption of crude oil averaged 9.3 lb. per mile, according to the Zeitung des Vereines Deutscher Eisenbahn Verwaltungen.

The use of motion pictures in the producing and distributing ends of a business is the subject of what is known as the May dinner meeting of the Efficiency Society, to be held on Tuesday, May 26, at the Aldine Club, 200 Fifth avenue, New York City.

RELATIVE REFINING POWERS

Electric Induction and Arc Furnaces for Steel Compared

A discussion by correspondence has been appearing in recent issues of Metallurgical and Chemical Engineering on the relative refining possibilities of the induction and arc electric steel furnaces as well as their efficiency. Important opinions as to the refining merits are reproduced here.

In the February, 1914, issue, Ivar Rennerfelt, of Stockholm, Sweden, inventor of the Rennerfelt arc furnace, referring to previously published statements, says:

The opinions about the merits of the induction furnace seem to be rather diverging among metallurgical engineers. Joh. Härdén makes the statement that "it is well known that very little refining as regards sulphur and phosphorus can be effected in the induction furnace. . . ." and proceeds to give some very good reasons for the alleged deficiency of the induction furnace in this respect. The statement is quite interesting as it emanates from a metallurgical engineer of high standing and closely associated with the induction furnace interests in Great Britain.

Contrary to said opinion are, however, some remarks by C. H. Vom Baur in your January number for 1912, stating that he witnessed a 10-ton induction furnace refining basic Bessemer metal with phosphorus 0.08 and sulphur 0.09, getting phosphorus and sulphur down to 0.008 per cent., and sometimes to traces and at the same time achieving a high degree of deoxidation.

There is entirely too much discrepancy between the two statements and this fact is certainly worth a careful consideration when deciding whether to install an inducton furnace or a modern arc furnace.

T. D. Robertson makes the point that the induction furnaces are difficult to use for refining purposes. The induction furnaces admittedly possess some beautiful features, but also have too many practical drawbacks to become ever general favorites or even to enable them to hold the place they have been occupying in the electrometallurgical industry. It would greatly benefit the development of the electric refining methods if an unprejudiced discussion could be started regarding the real and imaginary merits of all the different systems of electric furnaces now offered to the trade.

Taking up Mr. Rennerfelt's remarks, Joh. Härdén, of Luton, England, makes the following comments in the March issue of the same journal:

As to the refining question, it is well known and has often been repeated both by myself and others that the single-ring induction furnace, with its narrow channel and small bath surface, is not intended to be used for the removal of sulphur and phosphorus, but in many respects it is an ideal melting furnace and is therefore recommended as such. It was this I had in mind when the statements quoted were made.

The "combination" induction furnace of the Rodenhauser type, however, to which C. H. Vom Baur no doubt was referring in his article, and which I also have had many opportunities to watch, has very good refining possibilities on account of its enlarged central hearth and larger bath-surface. So has also the double-ring induction furnace designed by O. Frick.

It is not my intention to enter into a controversy as to the relative merits or disadvantages of arc furnaces and induction furnaces; both have their fields and if one is asked to recommend one or the other, as is frequently the case, the answer must be made solely with the purpose in view for which the furnace is intended, disregarding any sentiment in favor of one or the other. Special conditions, as regards the work to be carried out, the locality, the available electricity supply, the question of continuous or intermittent operation, etc., must be carefully considered in each individual case before one is able to recommend one system or the other.

An open discussion, such as Mr. Rennerfelt suggests, would no doubt be of general interest. But it is very questionable whether it would lead to any so-called final decision. Both systems will no doubt continue to live side by side, as past experience seems to indicate. Only the most careful consideration of each individual case and a full knowledge of the merits and possibilities, as well as the drawbacks and limitations of the various furnace types, will enable the engineer and metallurgist to make up his mind which type is most likely to be successful in his particular case.

Discussing the remarks of both Mr. Rennerfelt and Mr. Härdén, C. H. Vom Baur of Douglaston, N. Y., says in the March issue:

No doubt what Mr. Härdén had reference to was a single-ring induction furnace of the Kjellin type. My own experience with furnaces of this kind has confirmed the view that it is impractical to endeavor to refine steel with the usual slags in a single-ring and narrow-channeled induction furnace. However, all these furnaces had to have their beginning, and it is now over a dozen years since Kjellin first placed an induction furnace in regular commercial operation. It is over seven years since the first wide-hearthed induction furnace was put in operation, and one is now under construction with a bath the exact proportions of an open-hearth of corresponding size. The induction furnace will soon be in its early manhood, with the progress now going on.

To return to the refining. As soon as a two-ring induction furnace was placed in practical operation, it was demonstrated that any degree of refining of phosphorus and sulphur and general degasification could be obtained. A curve taken from Rodenhauser's and Schoenawa's book on "Electric Furnaces in the Iron and Steel Industry," page 399, shows that the phosphorus dropped from 0.06 to 0.025 per cent. in the first 20 minutes, while the desulphurization was from 0.065 per cent. to traces in somewhat more than an hour. The general deoxidation or degasification is exemplified by the excellent physical qualities of tool steel—about 57 varieties—not to mention rail steel and others, made in the 8 to 10-ton Roechling-Rodenhauser furnace, charged with liquid basic Bessemer steel.

There are as many induction furnaces to-day in Germany as there are arc furnaces, so that favoritism is at least evenly divided, even though the induction furnace installations are usually more expensive for the same size than arc furnaces. At Kladno, the Poldihuette after using a 4-ton Kjellin furnace, single-ring type, for about six years is installing an improved design of induction furnace of 13 tons capacity. One of the large iron works of eastern Pennsylvania is installing two 20-ton induction furnaces. Krupp at Essen has two 10-ton induction furnaces in regular operation, so that whatever their "practical drawbacks" are, their virtues are enough to overcome them, as the repeat orders indicate. The induction furnace is a very rugged child in the electro-metallurgical industry just now, even though it was a little dwarfed in its infancy.

The New York Section of the American Chemical Society and the American Electrochemical Society will hold a joint meeting at Rumford Hall, 50 East Forty-first street, New York, on the evening of Friday, May 22, at which papers will be read by Gilbert Rigg on "Refractories"; Gail Mersereau, "Substitutes for Automobile Gasoline"; W. F. Rittman, "The Theoretical Problems Involved in the Cracking of Oils"; Charles E. Pellew, "Ferrosilicon and Its Dangers."

The Associated Advertising Clubs of America will hold their tenth annual convention at Toronto, Ont., June 21 to 25. Transportation details and hotel accommodations are being arranged by the Advertising Men's League, 200 Fifth avenue, New York, John Sullivan being chairman of the committee. A special train to Toronto will be run on the New York Central Lines, leaving Grand Central Terminal, New York, June 20 at 5.30 p. m.

Production of Structural Shapes, Wire Rods and Nails in 1913

We have received from William G. Gray, in charge of the Bureau of Statistics of the American Iron and Steel Institute, special statistical bulletin No. 4, giving statistics of the production of structural shapes, wire rods and nails in the United States in 1913. An abstract of the figures given in this bulletin is presented below:

Structural Shapes

The total production of beams, beam girders, zee bars, tees, channels, angles, and other forms of heavy and light iron and steel structural shapes in 1913 amounted to 3,004,889 gross tons, against 2,846,487 tons in 1912, an increase of 158,402 tons, or over 5.5 per cent. The output in 1913 was the largest in the history of the trade. Of the total in 1913, 2,553,806 tons were heavy structural shapes, against 2,470,415 tons in 1912, and 451,083 tons were light structural shapes, against 376,072 tons in 1912. All the heavy structural shapes were rolled from steel in both 1912 and 1913. Of the light structural shapes about 3841 tons were rolled from iron in 1913, against about 5517 tons in 1912, and about 447,242 tons were rolled from steel, against about 370,555 tons in 1912.

Prior to 1912 the output of heavy structural shapes was not separated from the output of light structural shapes. The figures given for heavy structural shapes for 1912 and 1913 include all beams, tees, zee bars, angles, channels, etc., having one leg or web of 3 in. and over which were rolled for structural or fabricating purposes, while the figures given for light structural shapes include only such light shapes and small angles, etc., as were rolled for use in the manufacture of bedsteads, agricultural implements, fences, safes, vaults, or for other fabricating purposes having a section smaller than is provided for in the heavy structural classification. The production of iron and steel plates, girders made from plates, merchant bars, bars for reinforced concrete work, sheet piling, etc., all of which are provided for elsewhere, is not included in any of the figures given for structural shapes.

In the following table the production of heavy and light structural shapes by States is separately given for 1913:

States—Gross tons	Heavy shapes	Light shapes	Total
New York, N. J. and Pa.	2,028,320	246,975	2,275,295
Alabama and Ohio	15,092	72,446	87,538
Ind., Ill., Wis., Col., and Cal.	510,394	131,662	642,056
Total for 1913	2,553,806	451,083	3,004,889
Total for 1912	2,470,415	376,072	2,846,487

In 1913 there were 39 works in 10 States which rolled heavy or light structural shapes. In 1912 there were 40 works in the same States which rolled heavy or light structural shapes. Pennsylvania made over 71 per cent. of the total production in 1913, against over 72 per cent. in 1912.

The following table gives the production of structural shapes from 1892 to 1913:

Years	Gross tons	Years	Gross tons	Years	Gross tons
1892	453,957	1900	815,161	1908	1,083,181
1893	387,307	1901	1,013,150	1909	2,275,562
1894	360,305	1902	1,300,326	1910	2,266,890
1895	517,920	1903	1,095,813	1911	1,912,367
1896	495,571	1904	949,146	1912	2,846,487
1897	583,790	1905	1,660,519	1913	3,004,889
1898	702,197	1906	2,118,772	.....	.....
1899	850,376	1907	1,940,352	.....	.....

Wire Rods

The total production of iron and steel wire rods in 1913 amounted to 2,464,807 gross tons, against 2,653,553 tons in 1912, a decrease of 188,746 tons, or over 7.1 per cent. In 1913 the steel wire rods rolled amounted to 2,463,975 tons and the iron rods to 832 tons, as compared with 2,652,264 tons of steel and 1289 tons of iron rods rolled in 1912. Small quantities of steel copper-clad wire rods are included in the totals for recent years. It was necessary to estimate the output of one plant in 1913. The maximum production of wire rods was reached in 1912. The year of next largest production was 1913. Since 1910 the production by States has been as follows:

States—Gross tons	1910	1911	1912	1913
Mass., R.I., N.Y., & N.J.	246,669	244,300	258,680	259,681
Pa.,Ky., Ga., Ala., Ohio	1,412,352	1,585,973	1,806,720	1,645,182
Indiana, Illinois, & Col.	582,809	620,180	588,153	559,944
Total	2,241,830	2,450,453	2,653,553	2,464,807

All the States named in the table rolled steel wire rods in 1913. Iron wire rods were rolled by Rhode Island. In 1913 Pennsylvania rolled over 44.1 per cent. of the total production, against over 44.6 per cent. in 1912. At the close of 1913 one wire-rod mill was almost completed in Alabama.

The following table gives the production of iron and steel wire rods from 1892 to 1913:

Years	Gross tons	Years	Gross tons	Years	Gross tons
1892	627,829	1900	846,291	1908	1,816,949
1893	537,272	1901	1,365,934	1909	2,335,685
1894	673,402	1902	1,574,293	1910	2,241,830
1895	791,130	1903	1,503,455	1911	2,450,453
1896	623,986	1904	1,699,028	1912	2,653,553
1897	970,736	1905	1,808,688	1913	2,464,807
1898	1,071,683	1906	1,871,614	.....	.....
1899	1,036,398	1907	2,017,583	.....	.....

Wire Nails

The production of wire nails in 1913 amounted to 13,559,727 kegs of 100 lb., as compared with 14,659,700 kegs in 1912, a decrease of 1,099,973 kegs, or over 7.5 per cent. Steel wire nails only were made in both years. It was necessary to estimate the output of a few plants in 1913. The following table gives the output by States from 1910 to 1913:

States. Kegs of 100 pounds	1910	1911	1912	1913
Mass., R. I., & Conn.	175,730	107,740	112,870	116,782
N. Y., N. J., and Pa.	5,457,099	6,485,729	7,389,861	6,890,285
Md., Ky., Ga., Ala., and Ohio	3,503,433	3,628,584	3,853,667	3,372,417
Indiana and Illinois.	2,906,274	2,637,000	2,670,166	2,653,180
Wis., Col., and Cal.	662,366	578,725	633,136	527,063
Total	12,704,902	13,437,778	14,659,700	13,559,727

In 1913 wire nails were made by 51 works in 15 States. In 1912 wire nails were made by 50 works in 14 States. Five wire-nail plants were idle in 1913, against 6 in 1912. At the close of 1913 one plant for the manufacture of wire nails was almost completed in Alabama.

The leading producer of wire nails in 1913 was Pennsylvania, which made 6,701,936 kegs, or over 49.4 per cent. of the total.

Cut Nails

The production of iron and steel nails and spikes cut from plates in 1913 amounted to 842,038 kegs of 100 lb., against 978,415 kegs in 1912, a decrease of 136,377 kegs, or over 13.9 per cent.

The following table gives the production by States in 1912 and 1913, iron cut nails being separated from steel cut nails for 1913. Horseshoe nails, cut tacks, wire nails, or railroad or other forged iron or steel spikes are not included:

States. Kegs of 100 pounds	1913 Iron	1913 Steel	1913 Total	1912 Total
Pennsylvania	135,835	306,859	442,694	510,804
Massachusetts, West Virginia, and Ohio	.....	264,161	264,161	280,689
Kentucky, Indiana, Illinois, & Wisconsin	11,000	124,183	135,183	186,922
Total	146,835	695,203	842,038	978,415

In 1913 almost 82.6 per cent. of the total production was cut from steel plate and over 17.4 per cent. from iron plate, while in 1912 a little over 78.8 per cent. was cut from steel plate and almost 21.2 per cent. from iron plate.

Sixteen works in 8 States made cut nails in 1913. In 1912 there were 17 works in the same number of States which made cut nails. Eight works were idle in 1913, as compared with the same number of works in 1912.

Pennsylvania was the leading producer of cut nails in 1913, as it has been for many years, its output amounting to 442,694 kegs, or over 52.5 per cent. of the total.

Capital Costs in a Manufacturing Business

Three Types of Amortization—Charges to Be Made on Account of Insurance, Taxes and Repairs—Third Article on Industrial Economics

BY FORREST E. CARDULLO

Amortization is the destruction of the useful value of a piece of apparatus or property, because of changing methods or conditions. When it can be foreseen, it is in the nature of an annual charge upon capital. Several examples may be given of amortization to show what it is.

Let us suppose that a company owns the mineral rights to 1000 acres of land underlaid with coal. A few borings will show exactly how many veins there are and how thick these veins are. There is in the earth a definite amount of coal which can be taken out. When this coal is removed the mining machinery has only second or scrap value and the improvements made on the property have no value whatever. The number of years' life of the mine depends on the rate at which the coal is mined and this in turn depends on the equipment which is available. For any given equipment there is therefore a definite life to the mine and at the end of this period we must have recovered the cost of the investment. If the life of the mine is 20 years, then the entire equipment will have only second hand value at the end of 20 years, and the grading, timbering and other improvements of that nature will have no value whatever. Consequently, we must set aside each year for an amortization fund sufficient money so that the value of these improvements will be recovered at the end of 20 years. If the improvements are made not when mining commences, but at a later date, the annual amortization will be even larger, since the value of the improvements must be recovered in less time. The amortization fund is assumed to be invested at compound interest at the normal rate.

A tract of timber is a very similar proposition. The amount of timber which can be cut from a given tract can be readily ascertained and the length of time which it will take to cut the tract will depend upon the equipment available. If a logging railroad is built into the tract the rolling stock will have the second hand value when the tract is cut, or if it belongs to a company engaged in extensive logging operations it may be moved from place to place without loss in value until it is worn out. However, the labor expended in constructing a railroad becomes a loss as soon as the timber is cut. Consequently, a fund must be set aside to meet this loss at the time when the timber is cut.

AMORTIZATION DUE TO UNEXPECTED OBSOLESCENCE

The two examples given above are of cases where the material which is to be worked becomes exhausted. A different type of amortization, which cannot be foreseen, is due to the replacement of old types of apparatus by more modern and efficient types, in spite of the fact that the old apparatus is still capable of giving as good and as satisfactory service as it ever gave. One of the best examples of this is a group of steam engines in the power plant of the Boston Edison Company. These engines are large and well designed and are highly efficient. They are to-day as good as new, yet they are not used for the reason that the operating expenses of a turbine plant are enough less than the operating expenses of the engine plant, so that it is cheaper to buy turbines and let the engines lie idle than it is to operate the engines. At the time these engines were installed this condition could not have been foreseen.

A steam plant may in a similar manner become useless on account of the introduction of water power by long distance electric transmission. By the introduction of high-speed steel millions of dollars' worth of machine tools were made practically useless. The failure of the natural gas fields in the Pittsburgh district rendered useless glass factories costing millions of dollars. Hundreds of examples could be cited of capital the value of which has been destroyed by changes in the art in which it was invested, by the shifting of population, by the unexpected extinction of natural resources, or by other changes in conditions which could not be clearly foreseen.

We therefore have two classes of amortization. The one can be foreseen and its amount definitely calculated in advance. The other cannot be foreseen and therefore its amount cannot be calculated at all. On this account it is customary to adopt 40 years as the maximum life of any type of apparatus, on the assumption that even though it will not be worn out in 40 years, the probabilities are that at the end of that time some better and more efficient form of apparatus will be on the market which should be substituted for it.

COMPUTING AMORTIZATION FUNDS

When amortization is of the first type and the life of the equipment is known the annual amortization is calculated in exactly the same way as depreciation. Each year a certain sum is set aside at compound interest at the normal rate, so that at the end of the useful life of the equipment an amount equal to its cost, or to the difference between its cost and second-hand value, will have accumulated. For example, if the life of a mine is fifteen years, the cost of the plant is $125,000 and the second-hand and scrap value of the plant is $25,000, an amortization fund of $100,000 must be accumulated in fifteen years. In order to do this $5182 must be set aside each year at, say, 3½ per cent. compound interest. The amortization is therefore in this case 4.14 per cent. per year, reckoned on the $125,000.

When amortization can be computed in advance in this way it takes the place of depreciation. We cannot have both depreciation and amortization at the same time, as a piece of equipment cannot have two useful lives during the same period of time.

When amortization cannot be foreseen different methods must be employed in allowing for it. There are two different types of amortization which cannot be foreseen. An example of the first type is a gold mine where the extent and richness of the deposits cannot be computed in advance. It may be that the mine will have a profitable life of 10 years or its profitable life may be 50 years. No one can tell. If we have gone ahead on the assumption that the profitable life of the mine is 30 years and the deposits are exhausted at the end of 10 years, a considerable amount may have been lost.

Similarly, money may be invested in an industry and the product of the industry may subsequently go out of use. There is no way in which this type of amortization can be computed in advance, and it simply has to be accepted as a loss whenever its amount becomes known. In those industries in which it is likely to occur we expect, and usually receive, an unusually high rate in the form of profits, dividends or interest, when the industry is successful.

UNFORESEEN AMORTIZATION NOT CHARGED AS LOSS

Amortization which cannot be foreseen need not always be charged as a loss. An example will serve to illustrate a proper method of allowing for such amortization. Let us suppose that a company invested $1,000,000 in reciprocating engines. The probable life of these engines may be taken at 40 years and the depreciation is therefore $10,520 a year, when computed at 4 per cent. At the end of 10 years the accumulated depreciation fund will amount to $126,300. The difference between the original cost of a piece of equipment and its accumulated depreciation or amortization fund is known as its book value. The book value of these engines at the end of ten years will be $873,700. Their second-hand value will be let us say $300,000. At this time it is discovered that it is advisable to replace the engines by steam turbines, for the reason that the steam turbine plant is equally efficient in the use of fuel and requires very much less labor for its operation, besides costing less for supplies, etc. If a steam turbine plant is installed the company will lose the difference between the book value of their engines and their second-hand value, or $473,700. If the probable life of the turbine plant be assumed to be 40 years, this loss must be counted as part of the cost of the turbines, and upon this loss we must charge interest at the normal rate and depreciation for the forty years. Since, however, the engines are not in use, but have been sold, we may charge no amortization, taxes, repairs, or insurance upon the loss, although all of these elements are chargeable upon the money actually invested in the steam turbines.

It may be seen from the above discussion that there are three types of amortization. Amortization of the first type can be foreseen and its annual amount can be computed. Amortization of the second type cannot be foreseen, and it must be charged as a loss when it occurs for the reason that when it occurs the possibility of realizing a profit is destroyed. Amortization of the third type cannot be foreseen, but when it occurs it may be charged as a part of the cost of the equipment which replaces the equipment whose usefulness has been destroyed.

INSURANCE

Insurance is that annual charge which must be made against the cost of a piece of equipment to cover the chance of loss due to its destruction by accident. In the case of wooden buildings fire is the principal cause of destruction. In the case of boilers and power plants generally explosion is the principal cause of destruction. There are, however, many other causes of destruction which must be guarded against, and insurance is a necessary part of the cost of maintaining any piece of engineering apparatus.

The principles by which the amount of the insurance charge may be estimated may be understood from the following simplified illustration. We will assume that there is a community of 1000 houses, all of equal value when new, and of ages ranging from 1 to 50 years. Let us suppose that there are 10 fires each year, resulting in the total destruction of 10 houses. The average age of the burned houses will of course be 25 years, and the average book value will be about two-thirds of the cost of a new house. The loss from fire will therefore be 2/3 per cent. of the total cost when new of all of the houses. The insurance cost in such a case would be 2/3 per cent. per year. The insurance premium which would have to be paid in case one house out of every one hundred was completely destroyed by fire each year would, however, be higher than 2/3 per cent., as the cost of conducting the insurance company would have to be added in order to determine the premium to be paid.

Another point which should be noted in connection with insurance is the fact that the annual insurance chargeable against a piece of apparatus does not depend upon its value alone, but also on the value of the property which would probably be destroyed along with it. For instance, the insurance chargeable against a boiler must not only provide against the chance of destruction of the boiler itself, but also of the building in which it is contained and the apparatus in this building.

The cost of insurance will vary in accordance with the "nature of the risk." In the case of an incombustible building having incombustible contents, as for instance a brick machine shop, the fire risk is zero. In the case of an incombustible building having combustible contents, as for instance a brick and steel building used for pattern storage, the risk, even on the building itself may be quite high. In the case of a fireproof building having combustible contents the risk would be considerably less, both to building and to contents. The risk of explosion in the case of a water-tube boiler is less than in the case of a return tubular boiler, and this, in turn, is less than the risk in the case of a locomotive type boiler.

WHEN TO CARRY ONE'S OWN INSURANCE

A concern which adopts the most approved methods of protection against fire or other damage will usually find it much cheaper to "carry its own insurance" (i.e., not to insure) than to pay the premiums asked by the average insurance company. I have in mind a certain corporation having several shops situated in grounds of ample area. These shops are separated from one another, are all one story in hight, and are built of brick and steel with plank roof covered with asphalt roofing. The contents of the building are machine tools and machinery in the process of manufacture. Both the buildings and their contents are incombustible, and in

The Coming Installments

of this short series of articles by Prof. Cardullo, who is head of the department of mechanical engineering at New Hampshire College, Durham, N. H., will cover **the cost of labor** and the **cost of material** in the consideration of the cost of manufacturing any article. In this and the articles in the issues of May 7 and May 14 is discussed the cost of the capital employed, with something yet to be said on the value of second-hand apparatus, on constructive and actual payments, etc.

addition the buildings are protected by automatic sprinklers. Without the sprinklers it would be possible to start a huge bonfire anywhere in the shops without causing appreciable damage. The sprinkler system makes the assurance doubly sure. Yet this company pays a considerable sum of money each year for fire insurance, which seems to me to be a waste of money.

Ordinarily, however, one cannot escape by failure to purchase insurance, and the cost of insurance is one of the legitimate costs of conducting business. The chances of destruction are always present, and one must be prepared by the accumulation of a sinking fund or in some other manner to pay the cost of insurance. The cost of insurance is usually a comparatively small charge upon the capital invested, and, as I have already indicated, may be reduced by proper design of buildings and equipment by proper materials and methods of construction, and by taking proper precautions tending to prevent fires, explosions and other destructive accidents.

The fixed charges upon sprinkler systems, fireproof doors and windows, water curtains and various other schemes for preventing or controlling fires, the cost of frequent and thorough boiler inspection, or the cost of any element tending to reduce the risk of destruction of property, may be regarded as insurance, although it is not usually classified in that way.

The insurance premiums on ordinary wooden buildings in which power is used run as high as 0.9 per cent. per year where no proper fire protection is available. When an ample water supply is available, this rate is very considerably reduced and usually the insurance against fire will not exceed 0.25 per cent. Boiler insurance very seldom exceeds 0.5 per cent. on properly constructed boilers. It will be seen from the above figures that insurance premiums are only a small portion of the fixed charges in most cases.

TAXES

Taxes are a charge against capital. The amount depends on the law and practice of the community in regard to industry. Taxes are usually levied by estimating the value of a piece of property and charging a certain percentage of that value as a tax. This estimated value, called the assessed valuation, is not usually the cost of the property, but is the sum which the property would bring if sold at a forced sale. The tax rate is usually 1½ to 2 per cent. of the assessed valuation. This is the equivalent of from 1 to 1½ per cent. of the actual value, in the case of real estate. In many communities machinery and stock in the process of manufacture are exempt from taxation. In other communities they are taxed at the same rate as real estate. Since machinery and stock will not bring as large a proportion of their value when sold at a forced sale as will real estate, the actual tax rate based upon the real value of machinery and stock is usually lower than the actual rate upon real estate and ranges from ½ to 1 per cent. Taxes upon the whole of the property of an industrial concern will average about 1 to 1¼ per cent. when machinery and stock are taxed, and from ½ to 1 per cent. when machinery and stock are exempt from taxation.

REPAIRS

The expenditures for repairs upon a given piece of equipment will vary from year to year. In order that an expenditure may be properly classed under this heading, it is necessary that it shall be made to restore property so that it is as satisfactory for use as it was originally. If the expenditure is for the purpose of improving the property, it cannot be classified under the heading of repairs, but becomes an original investment.

As the amount of money expended for repairs will vary from time to time, it must be transformed into an equal annual charge by the principles of present worth. In order to show the method of reducing occasional charges to equal annual charges, we will take as an example the painting and shingling of a house. Assume the house to have a useful life of 40 years, and that it is painted every 10 years and shingled every 20 years. Then at the end of its tenth, the twentieth and thirtieth years the house will be painted. At the end of the twentieth year the house will be shingled. Assume that the cost of painting is $100 and that of shingling $200, and that the interest rate is 4 per cent. The money expended the first time the house is painted would at the end of the useful life of the house (i.e. 30 years after it was expended) amount to $324.33, reckoned at 4 per cent. interest, compounded annually. In the same way, the expenditure for the second painting would amount at the end of 10 years to $219.11, the expenditure for shingling would amount at the end of 20 years to $438.22, and the expenditure for the third painting would amount, at the end of 10 years, to $148.02. The actual cost for repairs was $500, but at the end of the useful life of the house, this cost, with interest, would amount to $1,129.68. The annual charge for repairs will then be the sum which must be set aside at 4 per cent. interest each year in order to realize $1,129.68 at the end of 40 years. This amount is $11.89 per year.

The usual method of computing the annual charge for repairs is to divide the total amount to be expended by the total number of years. In this case this would be $500 divided by 40, or $12.50 a year. It will be noted that the difference in the results arrived at in the two methods is not great, and since the probable cost of future repairs cannot be accurately known, the common method may be considered to be equally reliable. The only way in which the probable cost of future repairs can be determined is from the records of similar enterprises extending over a period of years. We have no guarantee, however, that the cost of repairs in apparently similar cases will be the same, for it may be widely different on account of varying conditions. In order to express the repairs as a per cent. of the original cost is simply necessary to divide the annual charge for repairs by the initial cost of the property.

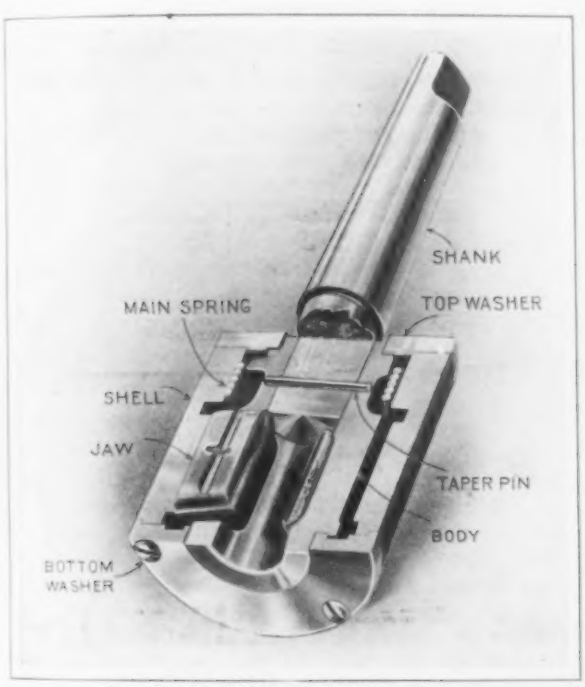
It may be noted in connection with the question of repairs that while repairs to new equipment and buildings are small in amount, that as much equipment and buildings grow older, the actual expenditure for repairs will increase from year to year. On this account it is necessary to accumulate a repair fund even when no repairs are made, because the time will come in the life of a piece of equipment when it will be necessary to draw upon that fund in order to effect a restoration to satisfactory working conditions.

The A. L. Sweet Iron Works, Medina, N. Y., in addition to the erection of a painting and enameling building and a tumbling building, both recently completed with equipment of the latest type, is erecting an extension to the foundry, 70 x 153 ft., together with a cupola building, 32 x 53 ft., and is installing a new 82-in. cupola, core ovens and traveling cranes. Alterations will be made to the present foundry, which is 70 x 150 ft. and 68 x 120 ft., in order to make it entirely fireproof.

Automatic Straight Shank Drill Chuck

The Wahlstrom Tool Company, 346 Carroll street, Brooklyn, N. Y., has improved its automatic drill chuck, which in its original form was illustrated in *The Iron Age*, October 10, 1912. The special feature about the new chuck is a new form of jaw, a one-piece construction having been substituted for the original jaw, which had five members. In the redesign of the chuck, some nine working parts have been eliminated.

The chuck is made in three sizes for handling drills up to maximum diameters of ½, ¾ and 1 in., and in addition there is one size of chuck for taper shank drills, ranging from ¼ to 1¼ in. in diameter. One of the points is that it is unnecessary for the drills to have tangs upon them, as the jaws of the chuck grip firmly, and the greater the resistance offered to the drill the tighter it is gripped by the chuck. The variation in the width of opening



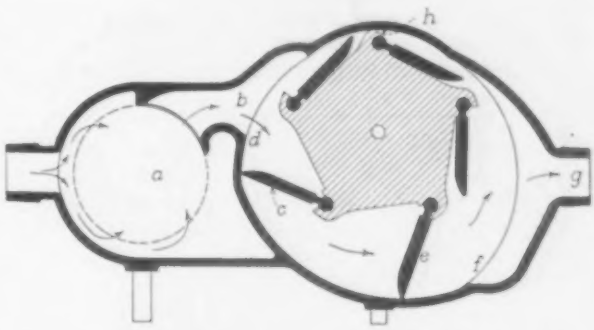
An Improved Type of Automatic Chuck for Straight Shank Drills

of the chuck is secured by a set of internal cam faces, which permit the jaws to open to a greater or less extent, as was the case with the original chuck.

A High-Pressure Volumetric Air Meter

For measuring the output of air compressors, the air consumption of pneumatic tools and the losses in compressed air transmission pipe lines, etc., the Kreutzberg Meter Company, City Hall Square Building, Chicago, Ill., has placed on the market a volumetric meter. This can be readily put in service in a pipe line by a workman or a pneumatic tool tester to show exactly how much air is being consumed by any particular pneumatic tool. The meter is made of bronze which eliminates corrosion and the weight of the 1-in. size, which is designed for use with pressures up to 150 lb., is only 28 lb. The amount of energy required to operate this meter is claimed to be very small and there is practically no leakage.

Referring to the accompanying diagram, which shows a cross-section of the meter, the air is admitted through the inlet at the left to the screen chamber *a*, from whence it passes into the meter through the passage *b*. It impinges against the vane *c*, causing the drum to rotate. When this vane has passed the point of cut-off *d*, a fixed volume of air is



Cross-Section of a Meter for Measuring the Output of Air Compressors, the Air Consumption of Pneumatic Tools, Pipe Line Losses, Etc.

contained between the vanes *c* and *e*. As soon as the latter reaches the outlet *f*, the pressures in the space between the vanes and the pipe line *g* are equalized, and this air is discharged into the pipe line. The meter is sealed at the top by the shoe *h*.

Advances in Iowa Freight Rates

The Interstate Commerce Commission has promulgated a decision making effective higher rates on iron and steel articles from the Mississippi River and Chicago to points in eastern Iowa and on scrap iron from Omaha, Neb., Sioux City, Iowa, and Sioux Falls, South Dakota, to St. Paul, Minn. These rates were announced in July and October, 1913, but suspended by the commission at the instance of manufacturers, shippers and commercial organizations.

Increases ranging from 1 to 1½c. per 100 lb. were made in the tariffs under consideration in the rates on iron and steel articles from Chicago and in their proportional rates from the Mississippi River on traffic originating east of the Indiana-Illinois line to stations in Iowa. The increases were applicable to stations as far west as Fort Dodge and Des Moines. Those of the increased rates against which protest was made were applicable principally to the commodities contained in the so-called "merchant iron list." The carriers in justifying the advance showed that the rates on iron and steel articles from Chicago to eastern Iowa are made with relation to rates on the same articles from Chicago to St. Paul.

The tariffs increased the rates on scrap iron to St. Paul from 8½ to 10c. per 100 lb. from Sioux Falls, S. Dak., and Sioux City, Iowa, and from 14½ to 15c. from Omaha.

In vacating the suspension order and thus putting the proposed tariffs into effect, the commission says in part:

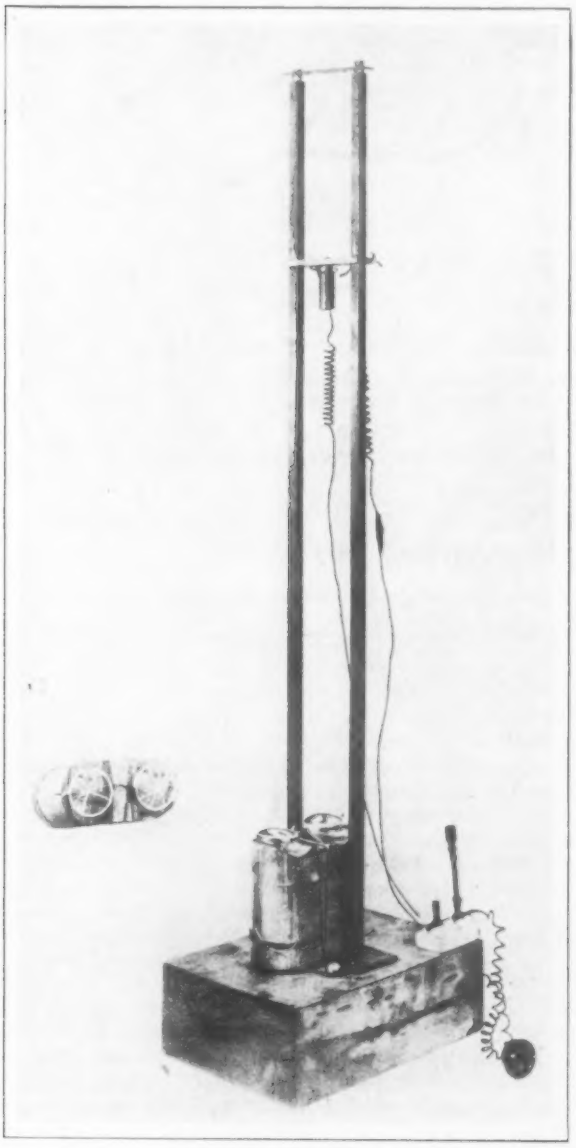
"Upon a careful consideration of all the facts, circumstances, and conditions appearing of record, it is our conclusion that the proposed rates on these articles have been justified.

"The proposed rate of 10c. on scrap iron from Sioux Falls to St. Paul involves a service of 237 miles and yields 8.4 mills per ton-mile. There is now pending before the commission a complaint alleging that the present rate on scrap iron of 15½c. from Sioux Falls to Chicago is unreasonable to the extent it exceeds 12c. Recently the commission permitted an increase from 8½ to 10c. in the scrap-iron rate from St. Paul to Chicago, a distance of 410 miles. The rate to St. Paul is 13½c. from Watertown, S. Dak., a distance of 224 miles, and 10c. from Fort Dodge, Iowa, a distance of 210 miles.

"We conclude that the proposed rates on scrap iron will not result in an undue relationship between them and other scrap-iron rates in the same general territory, and that they have been justified."

Standard Specifications for Safety Goggles

The question of the quality of the glass used in safety goggles has assumed such proportions that the Illinois Steel Company has adopted a set of specifications for chippers' goggles, and has devised



A ⅝-in. Steel Ball Is Dropped 21 In. to the Goggle Lens

a form of testing machine for use in connection with the specifications.

It is one of the first companies to recognize the importance of establishing a standard, though in an article in these columns, December 4, 1913, J. T. Brayton urged the importance of a standard of requirements.

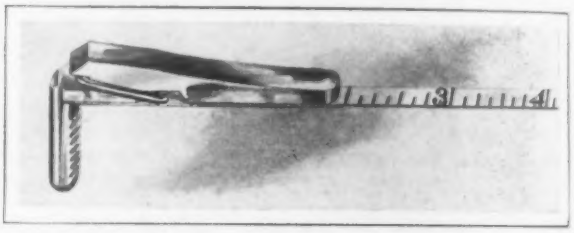
The Illinois machine was planned to reproduce the impact of a flying missile. This test was arranged to determine the relative strength of the glass and its action under conditions similar to those met in actual work. After measuring the thickness of each lens in five places, to show any variations in thickness, the goggle was fastened to a block in such a manner that no support should be given other than that afforded by the goggle frame. Strips of rubber and cotton composition on the supporting block under the goggle simulated the resilience of the human face. A hardened steel ball was used, ⅝ in. in diameter and weighing 16 grams (a little more than ½ oz.). This ball was held by a block of soft iron, magnetized by an electric current that could be broken at will. By this means the momentum of the falling ball was the same for each drop.

The specifications require that of each shipment of one gross or more, one dozen pairs of goggles must be tested and 25 per cent. of these must stand 15 blows without breaking or cracking. This means six lenses of the test dozen pairs must be intact after 15 blows, otherwise the entire shipment is rejected. It is further specified, however, that if the glass of any of the lenses of the test dozen break away from the inside surface of the lens, meaning the surface next to the eyes of the man wearing the goggles, then the shipment is rejected even if the required three pairs have stood the drop test.

Some particulars of tests made under these specifications by a large user of goggles were learned of from the Julius King Optical Company. It appears that goggles made with Saniglas withstood 50 blows without breaking.

Holding Hook for Steel Measuring Tapes

To enable both long and short measurements to be taken readily by one person instead of two, one at each end of the tape, the Lufkin Rule Company, Saginaw, Mich., has brought out a new de-



A Hook Which, When Attached to the Ring End of a Steel Tape, Allows Measurements To Be Taken by One Man

vice. It is a nickel-plated hook with a serrated face and is designed to be attached to the ring end of steel tapes, either ¼ or ⅜ in. wide. The serrated face of the hook grips the end of the article to be measured, and is constructed so that when it is attached to the end of a tape measuring from the end of the ring the zero point of the tape coincides exactly with the inside of the hook. When it is desired to wind the tape up in the case or to use it in the regular way the hook can be readily detached from the tape by passing the end of the tape proper over the sloping surface of the hook. This movement of the tape causes the ring to slip out of the socket in the hook. The attaching of the hook to the tape is readily accomplished by reversing the process.

George H. Charls, director of sales, and R. B. Carnahan, vice-president and chief metallurgist of the American Rolling Mill Company, Middletown, Ohio, recently returned from a European trip on which they negotiated two important license contracts. Under these the Shelton Iron & Coal Company, of Stoke-on-Trent, and Richard Johnson & Nephew, Ltd., of Manchester, England, secure the privilege of using the American Rolling Mill Company's method of producing ingot iron. The American Rolling Mill Company's output of ingot iron sheets, with the additions to its capacity made in recent years, is now put at more than 160,000 tons a year.

The New Haven Manufacturers' Exhibit, New Haven, Conn., in its official bulletin dated May 15, states that two years have passed since the founding of the exhibit and that it has fulfilled the aims of the founders, having proved profitable to the exhibitors. The bulletin publishes a long list of manufacturers making exhibits at 671-673 Chapel street.

COMMISSIONS DISAGREE

Pennsylvania Commission Opposes Interstate Commission as to Industrial Railroads

Pennsylvania's Public Service Commission has ruled that trunk line railroads can not abolish joint rates, allowances or divisions with industrial or "short line" railroads in the case brought by the Monongahela Connecting Railroad and the Union Railroad against the Pennsylvania, Baltimore & Ohio and Pittsburgh & Lake Erie railroads. The action just decided has been pending before the Pennsylvania Commission for several weeks. Industrial establishments of Pennsylvania, especially iron and steel companies, have been greatly interested. Hearings were held in Harrisburg and Philadelphia and the decision was rendered at the latter city on May 14.

The opinion and order of the commission are in part as follows:

OPINION

"From the evidence presented by complainants and by respondents to this commission at the abovementioned hearing, this commission finds that under the law of the commonwealth of Pennsylvania, as determined by the Supreme Court of the commonwealth, the Union Railroad Company is a public or common carrier possessed of all the rights and subject to the performance of all the duties of such public or common carrier, and that the legal status of the Monongahela Connecting Railroad is likewise the same.

"Although we have given to the opinion expressed by the Interstate Commerce Commission that consideration and respect to which it is properly entitled, and although we fully appreciate the desirability of uniformity of Federal and State regulation, so far as this may be maintained consistently with the law of this commonwealth, the commission is of the opinion that a conclusion at variance with that of the Supreme Court of the State of Pennsylvania with respect to the legal status of complainant railroad companies would not be justified.

"In the judgment of the commission, no evidence has been presented which would warrant the commission in finding that the joint rates between the respondents and the complainants, the Monongahela Connecting Railroad Company and the Union Railroad Company, or the division of said joint rates or the allowances thereout, as heretofore for many years established and maintained, are unjust or unreasonable or unjustly discriminatory or unduly preferential, and the commission accordingly expresses no opinion at this time as to the lawfulness or unlawfulness of the amount of such divisions or allowances. One of the duties of railroad common carriers under the law of Pennsylvania is to establish just and reasonable joint rates, and divisions thereof for through service over connecting lines of railroad. Such joint rates, divisions and allowances have not been shown by the evidence presented to this commission to be unlawful as to intrastate traffic.

"Further, the record as it now stands does not disclose that there is sufficient evidence to warrant the finding that the increase in rates to shippers involved in the proposed cancellation of joint rates for the same service as heretofore established would be just and reasonable.

ORDER

"It is ordered that as to intrastate traffic the respondents, the Baltimore & Ohio Railroad Company, the Pennsylvania Railroad Company and the Pittsburgh & Lake Erie Railroad Company and all other trunk line carriers proposing to cancel joint tariffs covering such traffic to and from the said Monongahela Connecting Railroad Company and the Union Railroad Company shall not charge, demand, collect or receive rates or charges other than those contained in tariffs applicable to such traffic which were in force and effect immediately prior to the proposed effective date of cancellation, all such proposed cancellations hereby being declared void, and all respondent common carriers shall continue the existing joint through rates, divisions and allowances on said intrastate traffic until the further order of the commission."

It is expected that the railroad companies will not permit the case to rest as thus decided but will appeal to the courts.

The Pennsylvania Public Service Commission has granted a hearing to representatives of the Cambria and Bethlehem Steel companies on their protests against permitting trunk lines to cancel joint rates and allowances to industrial railroads. These cases are separate from the Monongahela Connecting and Union railroad companies' cases. Other companies operating short line roads will also be heard.

National Foreign Trade Convention

The National Foreign Trade Convention will meet at the Hotel Raleigh, in Washington, D. C., May 27 and 28. In its composition and the range of topics to be discussed it is expected to be an unusual gathering. The general committee on arrangements for the meeting has been enlarged. It comprises an unusually representative body of men among whom may be mentioned: E. A. S. Clarke, president of the Lackawanna Steel Company, New York; James A. Farrell, president of the United States Steel Corporation, New York; Charles A. Schieren, Jr., president of the Charles A. Schieren Company, New York; Edward C. Simmons, chairman of the board of the Simmons Hardware Company, St. Louis, Mo.; Eugene P. Thomas, president, United States Steel Products Company, and several representative locomotive men. Secretary of Commerce Redfield will make the opening address on Wednesday, May 27, at which session President Farrell will also make an address. On Thursday morning Alba B. Johnson, president of the Baldwin Locomotive Works, Philadelphia, will discuss "South and Central America." At this session "American Export Trade to Europe" will be discussed by Cyrus H. McCormick, president of the International Harvester Company. A banquet to members and guests will be held at the Hotel Raleigh on the evening of the 27th at 7 o'clock.

Manufacturing industries in central and western Massachusetts and in northern Connecticut have been enormously benefited by the development of the water power of New England. Not a few large works have abandoned their power plants, because they can buy their power to economical advantage. The existing steam installations are maintained as a precaution against drought, which is the one bugbear that the hydroelectric plants are compelled to face. Even this is being guarded against by the creation of great storage reservoirs, the waters of which are held in reserve, obviating any cessation of activity except when the season is exceptionally dry. The latest completed development of water power is a 12,000-hp. unit at Falls Village, on the Housatonic River in Litchfield County, Conn.—a Stone & Webster property. The power will be distributed in the Naugatuck Valley, and will be available by June 1, it is stated.

Marquette, Mich., papers, referring to the John T. Jones furnace project in which J. M. Longyear and others are interested with the inventor, say that the Ayer forty at Presque Isle will probable be the site selected.

ESTABLISHED 1855

THE IRON AGE

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American Open-Hearth Economies

American steel makers along with those of Europe are indebted to Dr. Friedrich Schuster, general manager of the well-known steel works at Witkowitz, Austria, for the paper which we reprint elsewhere dealing with the Talbot and other open-hearth processes. Since the Brussels meeting of the Institute in September of last year, when it was announced that the Witkowitz management had promised to give out details of the practice there, open-hearth experts in all countries have been looking forward to their publication with unusual interest. The comparative merits of tilting and stationary furnaces were discussed at Brussels, and emphasis was put on the large outputs secured from the former, particularly where blown metal was charged. But the stationary furnace had its champions, especially in Germany, and records of 1500 tons a week from a 60-ton fixed furnace, with molten pig-iron charges, were cited, as against 1200 to 1500 tons a week from tilting furnaces in England, also using molten pig iron.

The Witkowitz experience was expected to be convincing because there steel was produced, under conditions as nearly identical as they could be maintained, from a 200-ton Talbot furnace, a 60-ton Wellman (tilting) furnace and three 50-ton to 60-ton stationary furnaces. With more detail probably than has ever been available in printed records of steel works operations, Dr. Schuster has stated the case for each of the three classes of furnaces at Witkowitz, and his verdict is strongly in favor of the Talbot type, which, for the reasons given, he considers "may reasonably be described as the open-hearth furnace of the future." The total costs of production figure out in the ratio of 100:105:107 for the Talbot, Wellman and fixed open-hearth under the Witkowitz conditions. That is no marked variation, considering the number of points in favor of the Talbot process which are found in Dr. Schuster's summary of conclusions. Had there been further refining in the preliminary furnace—for partial elimination of phosphorus, as is done at one important German works—the showing for the ordinary tilting furnace might have been considerably improved.

Recalling the discussion on stationary and tilting furnaces at the Brussels meeting of September, 1913, and the like discussions over other metallurgical apparatus and processes—the dry-air blast, for example—a proved economy by no means signifies the rapid displacement of all else by that which works the saving. The variables are always enough to furnish a basis for argument, and the human factor is the greatest variable of all. Success with a tilting furnace means inevitably active and successful partisans of a stationary furnace.

A paragraph in Dr. Schuster's paper which will arrest the attention of American steel men is that which refers to the abandonment of the duplex process at Witkowitz because of its high cost. The author expresses surprise that an American works which was the first to use the Talbot process on a considerable scale should build a later plant for duplexing after the latter process had been discarded at Witkowitz, the place of its origin. It is well to remember that conditions are not on all fours in European and American plants, nor is there any one best procedure for all American plants. Duplexing in this country may be a matter of expediency at one plant, of uniform economy at another, and of varying economy at another. Its large outputs are its most obvious and marked advantage. If pig iron can be made cheaply, as in the South, the loss of metal in the converter is much overbalanced by the decrease in unit cost due to quantity. With one Northern user of the duplex process the prime consideration was the independence it gave of a scrap market that at times made the cost of the pig and scrap process unconscionably high. One year's savings of that sort might overtop five years of such savings as a cost sheet might show, of one method over another. Then, again, duplexing at some American plants is a matter of the state of the steel market. In a slack time, when large output is not a desideratum but a drawback, and when the maker naturally seeks to use up his own accumulated scrap, the converter will be cut out for temporary economy.

Whatever the reasons for the abandonment of the duplex process at Witkowitz, experience in this country in the past five years has confirmed the judgment of those who adopted it. Its phenomenal outputs and the more recent mastery of some of its converter problems have rather caused it to gain ground, and its place in American steel works practice seems well assured.

Our Foreign Trade

The significance of merchandise trade balances in our foreign commerce does not lie in the reaching of especially high or low points in a particular month, but in the average over a period of time. An exceptional record made by a large trade balance in a month does no great good, nor is a very small balance in a single month a particular hardship. Last October there was a record trade balance in our favor—the astounding total for a single

month of $138,912,162. On the other hand, our favorable balance for March of this year was only $4,736,280. The average for the nine months ended March 31 was neither exceptionally large nor exceptionally small. The most concise statement of the general position is contained in the following table:

Favorable Merchandise Trade Balance

Fiscal year	
1910	$188,037,290
1911	522,094,094
1912	511,057,475
1913	652,875,915
1914 *	484,661,687

*Nine months only.

Since the poor year 1910 there have been successive increases until the fiscal year ended June 30, 1913, brought a very good balance, approximately comparable with the best we have had in the past. It would be somewhat hazardous to predict what the remaining three months of the present fiscal year will add. If they do no better than March they will give us a balance of only $500,000,000 for the full fiscal year. If they do as well as the corresponding months of last year they will give us over $630,000,000.

The smallness of the March trade balance was due to large imports rather than small exports, since the imports were the largest in our history with the trifling exception of last December. It may be said, in general, that December and March have been the only months in which imports have been measurably in excess of those which occurred prior to the new tariff of October 6, 1913, but on the other hand they so greatly exceed the previous average that the whole question of the effect of the reduced tariff encouraging imports is left in doubt. We must have more time in which to measure. That there is going to be an increase is made practically certain, but the extent of the increase cannot be guessed. Business has not been good, and when it becomes good it may be in circumstances which will encourage still heavier imports, or in circumstances tending to discourage imports.

It is well to emphasize the fact that iron and steel have played no part in reducing the general merchandise trade balance. The balance in iron and steel is always largely favorable, because exports are large, though fluctuating, while imports are always small. Thus while March iron and steel exports were small on the whole, though heavier than those of January or February, and March imports were relatively large, they still stand in the proportion of $20,551,137 and $2,880,165, or seven to one. The favorable balance in iron and steel alone is almost four times the favorable balance in all merchandise. The Government's returns under "iron and steel" do not include agricultural implements or electrical machinery. The exports of agricultural machinery alone amounted to $4,726,790, almost precisely equal to the total merchandise balance.

After this comparison, one may wonder what it really is we imported in March to make up the large total of $182,762,954. The question cannot be answered in brief, because the goods embrace such an extremely wide variety. Coffee and sugar made up $25,000,000, and there are no other particularly large items outside of fibers and rubber, for manufacturing. "Luxuries" do not loom as large in the cold Government figures as they do in tariff discussions. Spirits, wines and malt liquors make up only $1,603,021, while precious and semi-precious stones, with imitations thereof, make up only $3,126,787, so that these two much advertised items together constituted only 2.6 per cent. of our total imports in March.

The report of the Department of Commerce for April, received since the above was put in type, shows that imports for that month exceeded the exports of merchandise by $10,271,872. This is the first time in about four years that the balance of trade has been against this country. The imports of merchandise for the month reached a total value of $172,640,724, while the exports were valued at $162,368,852. While the imports were about $10,000,000 less than in March, the exports were about $25,000,000 less.

The month of April is usually, for some reason, a time in which exports fall below preceding months. Even when the balance of trade is running heavily in our favor, April will frequently show quite a contraction. It would therefore be unwise to infer from the figures just made public that our foreign trade has definitely changed and that we have entered upon a period of increasing indebtedness to foreign countries. The April figures of both imports and exports show that our foreign commerce is feeling the effects of the world-wide depression which now prevails.

Steel Production Statistics

Before the close of 1913 the fact became known through our monthly blast furnace returns that the year's pig iron production would break the previous record, made in 1912, and by the middle of February the official statistics showed that the increase from 1912 to 1913 was 4.16 per cent. Since then the interesting question has been the distribution of the output, for producers like to know which finished products are showing the most vitality and give the most promise for the future. Productive capacity was not altogether fully employed in 1913 and it is desirable to know, if possible, the lines in which the employment was most nearly full.

The first steel production statistics for 1913 referred to rails and appeared in the latter part of March. They showed a gain of 5.26 per cent. over 1912, but the production still fell short of the record made in 1906 by nearly 12 per cent.

The fresh statistics promulgated in the past week cover structural shapes and wire rods. Structural shapes show a gain over 1912 of 5.55 per cent., while rods show a decrease of 7.12 per cent. The fact is often referred to by rod producers that there is an excess of capacity in this branch of the steel industry. Even in 1912 this excess was apparent, and the decreased demand of 1913, involving a considerable reduction in output, accentuated this condition. In February of this year the United States Steel Corporation put in operation its new rod mill in the Birmingham district, with a capacity of more than 150,000 tons annually. Another factor is the new Canadian tariff which promises to curtail greatly our rod exports to Canada, a business which amounted to 61,000 tons in 1913.

The demand for rods is much steadier than the demand for most steel products, for the reason that wire is an article of daily consumption rather than

an important element in new construction. The first rod statistics were for 1888, showing 279,769 gross tons produced, and as that was four years before the wire nail passed the cut nail in volume of output the proportion of rod tonnage to pig iron tonnage was low, only 4.3 per cent. In 1897 rod production amounted to 970,736 tons, and just exceeded 10 per cent. of the pig iron production. Since then the rod production has averaged a trifle below 10 per cent. of the pig iron production, being generally between 8 and 9 per cent. Only in three years since—1904, 1908 and 1911—has the rod tonnage exceeded 10 per cent. of the pig iron tonnage, and the explanation of this showing is simple. Those were "off" years; pig iron production suffered severely, while the rod tonnage, involving an article of daily consumption, suffered relatively little. The poor showing of 1913, however, with only 2,464,807 tons produced, made the rod tonnage only 7.9 per cent. of the pig iron tonnage.

The production of all structural shapes, light and heavy, in 1913 amounted to 3,004,889 gross tons, showing, as already noted, the satisfactory gain of 5.55 per cent. over 1912. The gain over 1906, a very big year for structural steel construction, is 42 per cent., which again is quite satisfactory. In recent years there has been noted a tendency for the lighter steel products to gain in tonnage more rapidly than the heavy products, but care must be exercised not to force the conclusion too far. Structural shapes have held up very well. The production in the remarkable year 1906 was 8.4 per cent. as great as the pig iron production, while in 1913 the production was 9.7 per cent. as great as the pig iron production, showing no inconsequential increase. It is important to note, however, that while the statistics of total rolled iron and steel in 1913 are not yet available, a similar comparison with the rolled iron and steel production would not show a gain in the proportion of structural shapes from 1906 to 1913, this by reason of the fact that rolled iron and steel has been increasing in tonnage more rapidly than pig iron, the divergence being due partly to the slower growth of the foundry industry and partly to the more rapid increase in the consumption of old material in the steel industry.

The export trade has played a fairly important part in increasing our production of structural shapes, since the exports amounted to 112,555 tons in 1906, but increased to 288,164 tons in 1912 and to 416,264 tons in 1913. The apparent domestic consumption increased by 38,841 tons from 1912 to 1913, or 1.5 per cent.

English to Foreigners in Shop Hours

What promises to be an exceedingly interesting experiment is a plan to be instituted by both the Standard Oil Company and the General Chemical Company to provide for instruction in the English language within regular working hours. According to the meager facts available at this writing, one hour a day is to be devoted to this work, but whether the instruction will be undertaken in other than the New Jersey plants of these companies in the metropolitan district remains to be seen. The important fact is that the foreign-speaking employees of these works are to be given the opportunity the majority desires, to acquire some knowledge of English. Night schools have rarely been successful in reaching the largest possible numbers. It is obviously impracticable to control employees outside of working hours. The result is, of course, that groups speaking a common language remain a unit almost intact and do not coalesce to any extent even with similar groups, let alone those who represent more than one generation in the United States.

The importance of this experiment, should it prove successful, need not be argued. One of the trying things in management where the foreigner is concerned is to get him to understand exactly what he is to do. Manufacture is greatly handicapped in this respect, as is the worker himself. Ignorance of the tongue of the foremen and managers makes it difficult also to correct misunderstandings, which are sometimes the cause of labor troubles. This same lack defers indefinitely the necessary assimilation of American ideals and the shaping of the foreigners' conceptions of human relations and rights to what they are generally recognized here to be. Not the least evil is the difficulty of preventing accidents and of caring for the health and safety of the employees. The move of these two important companies, which in its aim is in line with what has already been done in some metal-working establishments, is one of great sociological and economic possibilities.

CORRESPONDENCE

Make Exhibits Worthy of Your Plant

To the Editor: Being engaged in publicity work for manufacturers, I have noticed time and again that there is always a grand rush just before a convention or exhibition in getting out printed matter and in getting up exhibits. The busy manufacturer does not look far enough ahead, and, although his intentions are certainly all right, his catalogue or bulletin comes out "half baked" and his exhibit does not come up to what he would like it to be. He is therefore obliged to tell those interested in his product that he is getting out a better catalogue and that he was so rushed that he had no time to give his exhibit proper attention.

There are many arguments pro and con concerning such a manufacturer. It may be that he was very busy, but there is always a solution to most problems and especially to a problem as simple as the getting up of publicity matter. Excuses should not be indulged in. Conventions are invariably announced months in advance, always allowing adequate time.

I know of instances, to be sure, where a new machine designed just a short time before the convention was to be shown and was shown. In such cases, of course, there is no remedy for rushing and evidence of haste is excusable.

If one cannot take care of his exhibit himself he should appoint somebody else to do it and have him think and act well in advance. It pays in the end.

W. F. SCHAPHORST.

NEW YORK CITY, May 18, 1914.

The Missouri, Kansas & Texas has ordered 5 mikado type locomotives from the American Locomotive Company, which is additional to the 25 ordered in March. The Mobile & Ohio has ordered 7 superheater consolidation type locomotives from the same company, and the Seaboard Air Line is reported to be in the market for 10 passenger and 15 freight locomotives.

Programme of Testing Materials Meeting

The American Society for Testing Materials will hold its seventeenth annual meeting in Atlantic City, N. J., June 30 to July 3. The programme has been compressed into four days, to leave Saturday, July 4, free from association demands.

Tuesday morning, June 30, will be taken up by the business affairs of the society and the reports of committees on fireproofing materials, on standard specifications for rubber products, with a paper on the testing of rubber belting, by W. E. Campbell; and a paper on "The Development and Use of an Autographic Friction Testing Machine for Mechanical Rubber Goods," by John M. Bierer.

The Tuesday afternoon session, convening at 3 p. m., is to be devoted to nonferrous metals, with committee reports on standard specifications for copper wire and on nonferrous metals and alloys. The papers include "Rational Test for Metallic Protective Coatings," by J. A. Capp, engineer, Testing Laboratory, General Electric Company, Schenectady, N. Y.; "Sampling and Methods of Analysis of Tin, Terne and Lead-Coated Sheets," by James A. Aupperle, metallurgical engineer, American Rolling Mill Company, Middletown, Ohio; "Initial Stress and Season Cracking in Drawn Brass Rods," by Ernst Jonson, engineer inspector, Board of Water Supply, New York City; "Some Considerations Affecting Specifications for Wrought Nonferrous Alloys," by William Reuben Webster, Bridgeport Brass Company, Bridgeport, Conn.; "Study of the Strength of Nonferrous Castings—A Comparison of Different Test Specimens," by L. P. Webert, Bath, Me.

Tuesday evening's session is to be opened by the address of the president, Prof. Arthur N. Talbot, University of Illinois, Urbana, Ill., to be followed by the papers: "Are the Effects of Overstrain Monotropic?" by Dr. Henry M. Howe, with discussion by James E. Howard and by J. S. Macgregor, Columbia University; "Hardness Tests," by J. J. Thomas, and "Present Policy Governing the Adoption of Standards," by Prof. Edgar Marburg.

The Wednesday morning session will consider steel subjects, with committee reports on the standard specifications for steel, heat treatment of iron and steel, standard specifications for cold-drawn steel, and on the magnetic testing of iron and steel. Papers are announced for this session entitled "Magnetic Habits of Alloy Steels," by Dr. J. A. Matthews, Syracuse; "A Failed Axle: Investigation of an Internal Transverse Fissure," by Robert Job, vice-president Milton Hersey Company, Ltd., Montreal; "Uniform Hardening of Steel," by Albert F. Shore, president Shore Instrument Company, New York City.

A session on Wednesday evening will take up, among other things, a report of the committee on standard specifications for cast iron and finished castings, together with a paper entitled "Some Notes on Chilled Cast Iron," by E. B. Tilt, engineer of tests, Canadian Pacific Railroad, Westmount, Que.; a report of the committee on standard specifications for wrought iron, with a paper entitled "New Vibratory Testing Machine and Results Obtained by Its Use," by S. V. Hunnings, chemist and engineer of tests, American Locomotive Company, Schenectady, N. Y., and the report of the committee on methods of sampling and analysis of coal.

The session of Thursday morning will be devoted to cement and concrete, including a paper on "Blast Furnace Slag as Aggregate in Concrete," by W. A. Aiken, inspecting engineer, Henry H. Stackman Engineering Company, Philadelphia, and a paper entitled "Some Observations Concerning the Use of Turned Sections in Tensile Tests on Reinforcing Bars," by Edgar P. Withrow.

The session on Thursday afternoon will be given over to lime, ceramics and road materials.

The session on Friday morning will consider preservative coatings, with a committee report on coatings for structural materials and a report on a permeability test for paints and varnishes, the latter by A. M. Muckenfuss, professor of chemistry, University of Mississippi.

CONTENTS

The Friday afternoon session, the last one of the meeting, is to be devoted to testing apparatus and methods, with committee reports on standard methods of testing and on standard tests for lubricants. Among the papers listed is one entitled "Simple Compression Machine for Testing Structural Materials," by W. O. Lichtner, and one on "Efficiency Testing Machine for Drills, Taps, Dies, etc.," by T. Y. Olsen.

A. W. Gibbs, chief mechanical engineer, Pennsylvania Railroad, has been nominated for president. A. A. Stevenson, vice-president Standard Steel Works Company, Philadelphia, has been nominated for second vice-president, Dr. Richard Moldenke, second vice-president, becoming first vice-president for the next year. Professor Marburg has been renominated for secretary and treasurer, and the following have been nominated for members of the executive committee, to serve two years: Robert Job, F. W. Kelley, vice-president Helderburg Cement Company, Albany, N. Y.; Prof. A. Marston, Iowa State College, Ames, Iowa, and S. S. Voorhees, engineer chemist, Bureau of Standards, Washington, D. C.

The Morden Frog & Crossing Works has moved its city sales office to the new Continental and Commercial Bank Building, 208 South La Salle street, Chicago, occupying rooms 1273-75-77-79.

The Iron and Metal Markets

LARGE SALES OF BASIC IRON

Finished Steel Situation Unchanged

Standard Order for 600,000 Boxes of Tin Plate—New Car Inquiries

The buying of about 75,000 tons of basic pig iron in eastern Pennsylvania is the most significant news of the week in that department of the market. One steel company took 50,000 tons, another 18,000 tons or more and a third a smaller amount. The price was close to $14 delivered or nearly 25 cents less than the basis of the Eastern purchases of basic early in the year. This buying is significant as showing the judgment of some buyers that they have caught the market at low point.

The general expression in the steel trade is that order books have not yet realized upon the prevalent feeling that a change for the better is at hand. In some instances larger specifications are reported for the first two weeks of May than in the first half of April; but as a rule buyers show little concern about their future needs, and even lower prices than they were able to get in January arouse no interest. Yet improved sentiment is everywhere admitted.

The car companies find a little encouragement in the revival of the Illinois Central inquiry for 3000 box cars, which is expected to be closed this week, along with 3000 for the Chicago & Northwestern. Actual orders of the week amount to 1400, besides 500 cars the St. Paul will build for itself. The Seaboard Air Line is inquiring for 445 cars.

Rail buying is limited to 3000 tons for the Great Northern, placed with the Canadian mill at Sault Ste Marie, 1800 tons for the Chicago & Western Indiana and 1600 tons for the Louisville & Nashville.

The structural situation is a trifle better as to volume but certainly not as to price. Considerable railroad bridge work is pending. Though part of it is some distance ahead, the remainder of the New York subway work means the imposing total of 200,000 tons.

The activity in reinforcing bars is welcome in the quietness that has settled over the general bar trade. Chicago mills are figuring on 11,000 tons for three important jobs, one at Minneapolis calling for 8000 tons. At Cleveland also some good sized reinforcement work is coming forward. The outlook for bar buying by agricultural interests is not promising, though that tonnage usually cuts a large figure about this time. The whole implement trade is overloaded with manufactured stocks which must be absorbed.

The Standard Oil Company's tin plate purchases for its trade in China and Japan amounted to 600,000 boxes, all placed in this country. Only two sizes were involved and prices were low, Welsh bidders making strenuous efforts to regain this Far East business.

Wrought pipe prices have been freely cut of late, particularly for line pipe. In merchant boiler tubes and seamless tubes demand is slightly better.

Oil tank work has brought about 8000 tons of plates to one Pittsburgh mill. More commonly 1.10c., Pittsburgh, is appearing on plate business. Chicago, in fact, is freely quoting 1.28c. on plates, shapes and bars and is quite generally disregarding the Pittsburgh basis.

There is no improvement in the price situation in wire and sheets. At Pittsburgh one interest has sold nails at $1.50.

A Pittsburgh selling firm has lately quoted low import prices on a number of foreign products, but imports grow exceedingly slowly. A 1400-ton lot of bars came in at Boston last week at a reported price of 1.23c., duty paid.

There is a beginning of betterment in foundry pig iron, both in inquiry and sales, but to some extent at the expense of prices.

The Eastern movement in basic iron has had no parallel as yet in the West, though at St. Louis 6000 tons was added to the recent purchases of a steel casting company, and in northern Ohio one round sale is reported and 10,000 tons is under inquiry.

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics

At date, one week, one month, and one year previous

	May 20, 1914.	May 13, 1914.	Apr. 22, 1914.	May 21, 1913.
Pig Iron, Per Gross Ton:				
No. 2 X, Philadelphia...	$14.75	$14.75	$15.00	$16.75
No. 2, Valley furnace....	13.00	13.00	13.25	14.50
No. 2 Southern, Cin'ti...	13.75	13.75	13.75	14.75
No. 2, Birmingham, Ala..	10.50	10.50	10.50	11.50
No. 2, furnace, Chicago*.	14.00	14.00	14.25	16.00
Basic, del'd, eastern Pa..	14.00	14.00	14.25	16.50
Basic, Valley furnace....	13.00	13.00	13.00	15.00
Bessemer, Pittsburgh....	14.90	14.90	14.90	17.50
Malleable Bess., Ch'go*..	14.00	14.00	14.25	16.00
Gray forge, Pittsburgh..	13.65	13.65	13.65	15.00
L. S. charcoal, Chicago.	15.75	15.75	15.75	18.00
Billets, etc., Per Gross Ton:				
Bess. billets, Pittsburgh..	20.00	20.00	21.00	27.00
O.-h. billets, Pittsburgh..	20.00	20.00	21.00	27.00
O.-h. sheet bars, P'gh...	21.00	21.00	22.00	27.00
Forging billets, base, P'gh.	25.00	25.00	25.00	34.00
O.-h. billets, Phila.....	22.40	22.40	23.40	28.00
Wire rods, Pittsburgh...	*25.50*	26.00	26.00	30.00
Old Material, Per Gross Ton:				
Iron rails, Chicago.....	12.75	12.75	12.75	15.75
Iron rails, Philadelphia.	*15.00*	15.50	15.50	18.00
Carwheels, Chicago.....	11.50	11.50	11.50	14.25
Carwheels, Philadelphia.	11.75	11.75	12.00	13.50
Heavy steel scrap, P'gh.	11.50	11.50	11.50	13.50
Heavy steel scrap, Phila.	**10.75**	10.50	11.00	12.00
Heavy steel scrap, Ch'go	*9.50*	9.75	10.00	10.75
No. 1 cast, Pittsburgh..	11.50	11.50	11.50	13.75
No. 1 cast, Philadelphia	*12.00*	12.50	13.00	13.50
No. 1 cast, Ch'go (net ton)	10.00	10.00	10.25	11.50
Finished Iron and Steel, Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Bess. rails, heavy, at mill	1.25	1.25	1.25	1.25
Iron bars, Philadelphia..	1.20	1.20	1.20	1.57½
Iron bars, Pittsburgh...	1.30	1.30	1.30	1.70
Iron bars, Chicago.....	1.10	1.10	1.12½	1.57½
Steel bars, Pittsburgh...	1.15	1.15	1.15	1.70
Steel bars, New York...	1.31	1.31	1.31	1.86
Tank plates, Pittsburgh.	*1.10*	1.15	1.15	1.60
Tank plates, New York.	*1.26*	1.31	1.31	1.76
Beams, etc., Pittsburgh..	1.15	1.15	1.15	1.50
Beams, etc., New York..	1.31	1.31	1.31	1.66
Skelp, grooved steel, P'gh	1.20	1.20	1.20	1.45
Skelp, sheared steel, P'gh	1.25	1.25	1.25	1.50
Steel hoops, Pittsburgh..	1.25	1.25	1.25	1.60
Sheets, Nails and Wire, Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Sheets, black, No. 28, P'gh	1.85	1.85	1.90	2.30
Galv. sheets, No. 28, P'gh	2.80	2.80	2.90	3.40
Wire nails, Pittsburgh..	1.55	1.55	1.60	1.80
Cut nails, Pittsburgh....	1.60	1.60	1.65	1.70
Fence wire, base, P'gh...	1.35	1.35	1.40	1.60
Barb wire, galv., P'gh...	1.95	1.95	2.00	2.20

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

Coke, **Connellsville,**

Per Net Ton at Oven:	May 20, 1914.	May 13, 1914.	Apr. 22, 1914.	May 21, 1913.
Furnace coke, prompt..	$1.75	$1.75	$1.85	$2.15
Furnace coke, future....	*1.90*	2.00	2.00	2.25
Foundry coke, prompt..	2.40	2.40	2.40	2.75
Foundry coke, future...	2.50	2.50	2.50	3.00

Metals.

Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Lake copper, New York.	14.37½	14.37½	14.75	16.00
Electrolytic copper, N. Y.	14.12½	14.12½	14.25	15.75
Spelter, St. Louis.....	5.00	5.00	5.00	5.30
Spelter, New York.....	5.15	5.15	5.15	5.45
Lead, St. Louis.....	3.80	3.80	3.70	4.20
Lead, New York.....	3.90	3.90	3.80	4.35
Tin, New York.....	*33.00*	33.70	35.60	48.25
Antimony, Hallett's, N. Y.	6.85	6.85	6.75	8.25
Tin plate, 100-lb. box, P'gh.	$3.30	$3.30	$3.30	$3.60

Finished Iron and Steel f. o. b. Pittsburgh

Freight rates from Pittsburgh, in carloads, per 100 lb.: New York, 16c.; Philadelphia, 15c.; Boston, 18c.; Buffalo, 11c.; Cleveland, 10c.; Cincinnati, 15c.; Indianapolis, 17c.; Chicago, 18c.; St. Louis, 22½c.; Kansas City, 42½c.; Omaha, 42½c.; St. Paul, 32c.; Denver, 84½c.; New Orleans, 30c.; Birmingham, Ala., 45c.; Pacific coast, 80c. on plates, structural shapes and sheets No. 11 and heavier; 85c. on sheets Nos. 12 to 16; 95c. on sheets No. 16 and lighter; 65c. on wrought pipe and boiler tubes.

Plates.—Tank plates, ¼ in. thick, 6¼ in. up to 100 in. wide, 1.10c. to 1.15c., base, net cash, 30 days. Following are stipulations prescribed by manufacturers with extras:

Rectangular plates, tank steel or conforming to manufacturer's standard specifications for structural steel dated February 6, 1903, or equivalent, ¼ in. and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per sq. ft., are considered ¼-in. plates. Plates over 72 in. wide must be ordered ¼ in. thick on edge, or not less than 11 lb. per sq. ft., to take base price. Plates over 72 in. wide ordered less than 11 lb. per sq. ft. down to the weight of 3-16 in. take the price of 3-16 in.

Allowable overweight, whether plates are ordered to gauge or weight, to be governed by the standard specifications of the Association of American Steel Manufacturers.

Extras	Cents per lb.
Gauges under ¼ in. to and including 3-16 in....	.10
Gauges under 3-16 in. to and including No. 8....	.15
Gauges under No. 8 to and including No. 9.....	.25
Gauges under No. 9 to and including No. 10...	.30
Gauges under No. 10 to and including No. 12...	.40
Sketches (including straight taper plates), 3 ft. and over	.10
Complete circles 3 ft. in diameter and over.....	.20
Boiler and flange steel	.10
"A. B. M. A." and ordinary firebox steel.....	.20
Still bottom steel	.30
Marine steel	.40
Locomotive firebox steel	.50
Widths over 100 in. up to 110 in., inclusive.....	.05
Widths over 110 in. up to 115 in., inclusive.....	.10
Widths over 115 in. up to 120 in., inclusive.....	.15
Widths over 120 in. up to 125 in., inclusive.....	.25
Widths over 125 in. up to 130 in., inclusive.....	.50
Widths over 130 in.	1.00
Cutting to lengths, under 3 ft., to 2 ft. inclusive.	.25
Cutting to lengths, under 2 ft., to 1 ft. inclusive.	.50
Cutting to lengths, under 1 ft.	1.55

No charge for cutting rectangular plates to lengths 3 ft. and over.

Structural Material.—I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles, 3 to 6 in. on one or both legs, ¼ in. thick and over, and zees, 3 in. and over, 1.15c. Extras on other shapes and sizes are as follows:

	Cents per lb.
I-beams over 15 in.	.10
H-beams over 18 in.	.10
Angles over 6 in. on one or both legs.	.10
Angles, 3 in. on one or both legs, less than ¼ in. thick, as per steel bar card, Sept. 1, 1909....	.70
Tees, structural sizes (except elevator, hand rail, car truck and conductor rail)	.05
Channels and tees, under 3 in. wide, as per steel bar card, Sept. 1, 1909..... .20 to	.80
Deck beams and bulb angles.	.30
Hand rail tees	.75
Cutting to lengths, under 3 ft. to 2 ft. inclusive.	.25
Cutting to lengths, under 2 ft. to 1 ft. inclusive.	.50
Cutting to lengths, under 1 ft.	1.55

No charge for cutting to lengths 3 ft. and over.

Wire Products.—Fence wire, Nos. 0 to 9, per 100 lb., terms 60 days or 2 per cent. discount in 10 days, carload lots to jobbers, annealed, $1.35; galvanized, $1.75. Galvanized barb wire and fence staples to jobbers, $1.95; painted, $1.55. Wire nails to jobbers, $1.55. Woven wire fencing, 73½ per cent. off list for carloads; 72½ off for 1000-rod lots; 71½ off for less than 1000-rod lots.

The following table gives the price to retail merchants on fence wire in less than carloads, with the extras added to the base price:

Plain Wire, per 100 lb.

Nos.	0 to 9	10	11	12&12½	13	14	15	16
Annealed	$1.55	$1.60	$1.65	$1.70	$1.80	$1.90	$2.00	$2.10
Galvanized ...	2.00	2.00	2.05	2.10	2.20	2.30	2.70	2.80

Wire Rods.—Bessemer, open-hearth and chain rods, $25.50.

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card on steel pipe in effect from April 20, 1914, and iron pipe from June 2, 1913, all full weight:

Butt Weld

Steel. Inches	Black	Galv.	Iron. Inches	Black	Galv.
⅛, ¼ and ⅜	73	52½	⅛ and ¼	66	47
½	77	66½	⅜	65	46
¾ to 3	80	71½	½	69	56
			¾ to 2½	72	61

Lap Weld

2	77	68½	1¼	56	45
2½ to 6	79	70½	1½	67	56
7 to 12	76	65½	2	68	58
13 to 15	53	...	2½ to 4	70	61
			4½ to 6	70	61
			7 to 12	68	55

Reamed and Drifted

1 to 2, butt	78	69½	1 to 1½, butt	70	59
2, lap	75	66½	2, butt	70	59
2½ to 6, lap	77	68½	1¼, lap	54	43
			1½, lap	65	54
			2, lap	66	56
			2½ to 4, lap	68	59

Butt Weld, extra strong, plain ends

⅛, ¼ and ⅜	68	57½	⅜	63	52
½	73	66½	½	67	60
¾ to 1½	77	70½	¾ to 1½	71	62
2 to 3	78	71½	2 and 2½	72	63

Lap Weld, extra strong, plain ends

2	74	65½	1½	65	59
2½ to 4	76	67½	2	66	58
4½ to 6	75	66½	2½ to 4	70	61
7 to 8	68	57½	4½ to 6	69	60
9 to 12	63	52½	7 to 8	62	53
			9 to 12	58	47

Butt Weld, double extra strong, plain ends

½	63	56½	½	57	49
¾ to 1½	66	59½	¾ to 1½	60	52
2 to 2½	68	61½	2 and 2½	62	54

Lap Weld, double extra strong, plain ends

2	64	57½	2	55	48
2½ to 4	66	59½	2½ to 4	60	54
4½ to 6	65	58½	4½ to 6	59	53
7 to 8	58	47½	7 to 8	52	42

To the large jobbing trade an additional 5 and 2½ per cent. is allowed over the above discounts.

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

Boiler Tubes.—Discounts to jobbers, in carloads, in effect from May 1, 1914, on steel and from January 2, 1914, on iron, are as follows:

Lap Welded Steel		*Standard Charcoal Iron*	
1¾ and 2 in.	62	1½ in.	45
2¼ in.	59	1¾ and 2 in.	49
2½ and 2¾ in.	65	2¼ in.	45
3 and 3¼ in.	70	2½ to 2¾ in.	54
3½ to 4½ in.	72	3 and 3¼ in.	57
5 and 6 in.	65	3½ to 4½ in.	60
7 to 13 in.	62	5 and 6 in.	49

Locomotive and steamship special charcoal grades bring higher prices.

2½ in. and smaller, over 18 ft., 10 per cent. net extra.

2¾ in. and larger, over 22 ft., 10 per cent. net extra.

Less than carloads will be sold at the delivered discounts for carloads, lowered by two points for lengths 22 ft. and under to destinations east of the Mississippi River; lengths over 22 ft., and all shipments going west of the Mississippi River must be sold f.o.b. mill at Pittsburgh basing discount, lowered by two points.

Sheets.—Makers' prices for mill shipment on sheets of U. S. Standard gauge, in carload and larger lots, on which jobbers charge the usual advance for small lots from store, as are follows, f.o.b. Pittsburgh, terms 30 days net or 2 per cent. cash discount in 10 days from date of invoice:

Blue Annealed Sheets

	Cents per lb.
Nos. 3 to 8	1.30
Nos. 9 to 10	1.35
Nos. 11 and 12	1.40
Nos. 13 and 14	1.45
Nos. 15 and 16	1.55

Box Annealed Sheets, Cold Rolled

Nos. 10 and 11	1.50 to 1.55
No. 12	1.50 to 1.55
Nos. 13 and 14	1.55 to 1.60
Nos. 15 and 16	1.60 to 1.65
Nos. 17 to 21	1.65 to 1.70
Nos. 22 and 24	1.70 to 1.75
Nos. 25 and 26	1.75 to 1.80
No. 27	1.80 to 1.85
No. 28	1.85 to 1.90
No. 29	1.90 to 1.95
No. 30	2.00 to 2.05

Galvanized Sheets of Black Sheet Gauge

	Cents per lb.
Nos. 10 and 11	1.80 to 1.85
No. 12	1.90 to 1.95
Nos. 13 and 14	1.90 to 1.95
Nos. 15 and 16	2.05 to 2.10
Nos. 17 to 21	2.20 to 2.25
Nos. 22 and 24	2.35 to 2.40
Nos. 25 and 26	2.50 to 2.55
No. 27	2.65 to 2.70
No. 28	2.80 to 2.85
No. 29	2.95 to 3.00
No. 30	3.10 to 3.15

Pittsburgh

PITTSBURGH, PA., May 19, 1914.

More favorable sentiment exists in the steel trade than for some time. This is not manifested as yet in much increase in new orders, though several of the larger steel companies say that specifications in the first half of May showed a slight increase over the same period in April. The feeling is growing that prices cannot go much lower. A circular sent out recently by the Biddle Purchasing Company, this city, offering foreign finished iron and steel at relatively low prices at different points of delivery in this country has created some stir in the trade. This circular quotes Belgian iron bars at 1.12c., Belgian steel bars, 1.03c., German open-hearth bars, 1.11c., Bessemer steel plates, 1.20c., and steel angles 1.08c., on approved specifications, c.i.f., New York, Boston or New Orleans for base sizes, no duty paid. A shipment of 1400 tons of foreign steel bars was recently landed at Boston at about 1.23c. delivered there, duty paid. Taking 18c. freight from Pittsburgh to Boston this would mean 1.05c. here, but experience is that domestic consumers willingly pay a premium of $2 a ton for American material over foreign, on account of the better service and usually better quality of the former. So far imports into this country have been light. While conditions in the local steel trade are but little better a good buying movement is looked for in June, and much more business is expected to be done in the last half of the year than in the first half. A few inquiries for steel cars are coming out, but buying of supplies by the railroads is almost at a standstill. Prices during the week have shown no material change, except on plates, which are selling more freely at 1.10c. Generally not enough new business is coming out in any lines to test prices thoroughly.

Pig Iron.—The only active inquiry in the local market for basic iron since the United Steel Company's purchase of 16,000 tons of basic was closed is that of the American Steel Foundries, which is inquiring for 10,000 tons of basic for delivery at its Alliance and Sharon works. The company has made offers which have not yet been accepted, but the business may possibly be closed in a few days. We note sales of several carloads of Bessemer iron at $14, Valley furnace. We quote Bessemer, $14; basic, $13; No. 2 foundry, $13 to $13.50; gray forge, $12.75; malleable Bessemer, $13.25, for delivery through first half of this year, all at Valley furnace, the freight rate to the Pittsburgh or Cleveland districts being 90c. a ton.

Billets and Sheet Bars.—No new business is coming out in either billets or sheet bars. One steel interest states that it has been offered above $21, Pittsburgh, for Bessemer or open-hearth sheet bars for third quarter delivery, but turned the business down as it does not care to sell so far ahead. Specifications from the tinplate mills against contracts for bars are fairly active, but from the sheet mills are dull. It is probable that prices on billets and sheet bars would be shaded on new business. We quote Bessemer and open-hearth billets at $20, and Bessemer and open-hearth sheet bars at $21, f.o.b. makers' mills, Pittsburgh or Youngstown, for May and June delivery; forging billets, $25 on desirable specifications, embracing only one size, and up to but not including 10 x 10 in., the regular extras being charged for larger sizes. On small orders forging billets are held at $26. We quote axle billets at $23 for desirable orders and $24 for small orders.

Muck Bar.—No sales of muck bar have been made in the local market for a long time, and we quote best grades nominally at $27, Pittsburgh.

Ferroalloys.—The reduction of $1 a ton, or from $39 to $38, Baltimore, in the price of English ferromanganese has not brought out any new business of moment. The freight from Baltimore to Pittsburgh is $2.16 per ton. Sales have been made of two carloads of 50 per cent. ferrosilicon at $73, delivered. We quote 50 per cent. ferrosilicon, in lots up to 100 tons, at $73; over 100 tons to 600 tons, $72; over 600 tons, $71, delivered in the Pittsburgh district. On 10 per cent. ferrosilicon the quotation is $19; 11 per cent., $20, and 12 per cent., $21, f.o.b. cars Jackson County, Ohio, or Ashland, Ky., furnace. We quote 20 per cent. spiegeleisen at $25 at furnace. We quote ferrotitanium at 8c. per lb. in carloads; 10c. in 2000-lb. lots and over, and 12½c. in less than 2000-lb. lots.

Structural Material.—New inquiries in the past week have been a little better. A very large amount of new work is being figured on, but little of it is in this district. The Jones & Laughlin Steel Company has taken 400 tons for new steel building for the Oxford Paper Company, Rumford Falls, Maine, and 200 tons for a new steel building for the United Fruit Company at San Domingo. Much complaint is heard as to the low prices at which fabricated work is being taken. We quote beams and channels up to 15 in. at 1.15c., f.o.b. Pittsburgh, but in some cases 1.12½c. has been done.

Wire Rods.—In sympathy with wire products prices on wire rods are lower, and we now quote Bessemer, open hearth and chain rods at $25.50, f.o.b. Pittsburgh.

Steel Rails.—The order for 1500 tons of standard sections for the New York, Susquehanna & Western referred to in the past few days is part of the order for about 3500 tons taken by the Carnegie Steel Company from the Erie Railroad several months ago. The Carnegie Company reports a fair run of small orders for standard sections, some up to 1000 tons, but no large contracts. The demand for light rails from the mining interests and traction lines is only fair. The amount of business in rails placed this year by the traction companies has been disappointing. We quote splice bars at 1.50c.; standard section Bessemer rails, 1.25c.; open-hearth standard sections, 1.34c., f.o.b. Pittsburgh. We quote light rails rolled from billets as follows: 25, 30, 35, 40 and 45 lb. sections, 1.10c.; 16 and 20 lb., 1.15c.; 12 and 14 lb., 1.20c., and 8 and 10 lb., 1.25c., in carload lots, f.o.b. Pittsburgh. For large lots, these prices might be slightly shaded.

Plates.—The market is still practically bare of active inquiries for steel cars, the only ones out being from the Delaware, Lackwanna & Western for 500 steel hopper cars and from the Illinois Central for 3000 box cars. The latter inquiry has been inactive for some time, but was recently revived. The American Car & Foundry Company will rebuild 222 coal cars for the Newburgh & South Shore. Considerable tonnage of plates is being used at present for oil-tank work throughout the country, and the Carnegie Steel Company has recently booked from 8000 to 10,000 tons for this class of work, including 5000 to 6000 tons for the Riter-Conley Mfg. Company. The larger mills are holding ¼-in. and heavier sheared plates at 1.15c., but some of the smaller mills are selling as low as 1.10c. on a limited range of sizes. We quote ¼-in. and heavier plates at 1.10c. to 1.15c. f.o.b. Pittsburgh, the lower price being quoted for desirable orders.

Skelp.—The local market is quiet. None of the mills is running to over 50 to 60 per cent. of capacity, and the consumption of skelp by pipe mills that buy in the open market is lighter than for some months. Prices are only fairly strong. We quote: Grooved steel skelp, 1.20c. to 1.25c.; sheared steel skelp, 1.25c. to 1.30c.; grooved iron skelp, 1.60c. to 1.65c., and sheared iron skelp, 1.65c. to 1.70c., delivered to consumers' mills in the Pittsburgh district.

Tin Plate.—The American Sheet & Tin Plate Company has taken an order from the Standard Oil Company for 600,000 boxes of re-export bright plate. There are only two sizes in this important order, one being 14 x 18¾, which is used in making the bodies, and the other 10 x 20, for making tops and bottoms of 5-gal. cans for shipping oil to China and Japan. The order is for delivery over the last six months of the year, and for the larger size is more than twice the quantity involved in the smaller size. Specifications

against contracts for tin plate have not been coming in very freely for the past two or three weeks, and the mills are running largely on specifications placed during March and April. This week the American Sheet & Tin Plate Company is operating to about 95 per cent., while McKeesport, Jones & Laughlin and other large plants are running practically to 100 per cent. New orders are light and only for small lots to meet current needs, and on these we quote 100-lb. 14 x 20 coke plate at $3.30 to $3.40, and 100-lb. 14 x 20 terne plate, $3.20 to $3.30 f.o.b. Pittsburgh.

Sheets.—No betterment is observed in the demand for black or galvanized sheets, or in prices, but the feeling is general that sheets are about as low as they will go. It is claimed that on No. 28 Bessemer black sheets at 1.80c. and No. 28 galvanized sheets at 2.80c., and in a few cases 2.75c., there is practically no profit. Sheet mills are still running light, the general average being not over 50 per cent. of capacity. The absolute minimum on No. 28 black sheets is 1.80c., but this price is made only by a few mills that have the advantage of location and do not always charge the Pittsburgh rate of freight to point of delivery. We quote Nos. 9 and 10 blue annealed sheets at 1.35c.; No. 28 Bessemer black at 1.85c. to 1.90c.; No. 28 galvanized at 2.80c. to 2.85c.; No. 28 black plate, tin mill sizes, H. R. and A., 1.90c.; Nos. 29 and 30, 1.95c. These prices are for carload lots, f.o.b. Pittsburgh, jobbers charging the usual advances for small lots from store.

Iron and Steel Bars.—The new demand for iron and steel bars continues quiet, being only for small lots to meet current needs. Specifications from the large consumers have been unsatisfactory so far this year, but it is believed that consumption of steel bars in the second half of the year will be much heavier than in the first half. Steel bars are still quoted at 1.15c., but in exceptional cases this has been shaded. We quote steel bars at 1.15c. and common iron bars at 1.30c., f.o.b. makers' mills, Pittsburgh. Regular extras for twisting reinforcing steel bars over the base price are as follows: ¾-in. and over, $1; ½ to 11/16-in., $1.50; under ½-in., $2.50 per net ton. These extras are not always observed.

Shafting.—Conditions in the shafting trade are unsatisfactory, both from the standpoint of prices and new business. Competition for the small new orders coming out is keen, and in some cases 66 per cent. off the list has been named. We quote cold-rolled shafting in carload and larger lots at 65 to 66 per cent. off, and on small lots about 63 per cent., delivered in base territory.

Spikes.—This branch of trade is extremely quiet, none of the makers running to more than 50 per cent. of capacity. New buying is only from hand to mouth and specifications against contracts placed early in the year are coming in but slowly. We quote standard sizes of railroad spikes at $1.40 and small railroad and boat spikes at $1.50 per 100 lb., f.o.b. Pittsburgh.

Merchant Steel.—A slight increase is reported in the demand for seasonable steels, but general buying is slow and only for small lots to cover current needs. One leading maker reports that its specifications in the first half of May were in excess of the same period in April. Prices are weak, and on small lots are about as follows: Iron finished tire, ½ x 1½ in. and larger, 1.30c., base; under ½ x 1½ in., 1.45c.; planished tire, 1.50c.; channel tire, ¾ to ⅞ and 1 in., 1.80c. to 1.90c.; 1⅛ in. and larger, 1.90c.; toe calk, 1.90c. to 2c., base; flat sleigh shoe, 1.65c.; concave and convex, 1.70c.; cutter shoe, tapered or bent, 2.20c. to 2.30c.; spring steel, 1.90c. to 2c.; machinery steel, smooth finish, 1.70c. We quote cold-rolled strip steel as follows: Base rates for 1 in. and 1½ in. and wider, under 0.20 carbon, and No. 10 and heavier, hard temper, 3.25c.; soft, 3.50c.; coils, hard, 3.15c.; soft, 3.40c.; freight allowed. The usual differentials apply for lighter sizes.

Car Wheels.—Local makers report a fair demand for passenger engine and tender car wheels, but little is being done in freight car wheels, owing to the fact that so few freight cars have been built for some time. The Forged Steel Wheel Company, Butler, Pa., has taken an order for the car wheels for 25 engines and tenders for the Delaware & Hudson. We quote 33-in. engine truck wheels at $21; 36-in. engine truck wheels, $22; 33-in. tender wheels, $17; 36-in. passenger and tender wheels, $19 to $19.50; 33-in. freight car wheels, $14.50 to $15, f.o.b. Pittsburgh.

Wire Products.—The demand for wire and wire nails, also for steel cut nails, is quiet and only for small lots to meet current needs. Wire mills report that specifications against contracts have slowed down considerably and trade will probably continue dull for the next two or three months. Prices are weak. A local wire nail interest is willing to accept desirable orders for wire nails on the basis of $1.50, f.o.b. Pittsburgh, but will not book contracts for future delivery at this price. We quote wire nails at $1.55; plain annealed wire, $1.35 to $1.40; galvanized barb wire and fence staples, $1.95 to $2; painted barb wire, $1.55 to $1.60, all per 100 lb., f.o.b. Pittsburgh, with actual freight added to point of delivery, terms being 30 days net less 2 per cent. off for cash in 10 days. We quote cut nails at $1.60, f.o.b. Pittsburgh. Discounts on woven wire fencing are 73½ per cent. off in carload lots, 72½ per cent. off on 1000-rod lots and 71½ per cent. on less than 1000-rod lots, all f.o.b. Pittsburgh.

Hoops and Bands.—Some small contracts for hoops and bands for delivery through July have been placed on the basis of about 1.15c. for steel bands and 1.25c. for hoops. These are from consumers who have actual work booked. No large business is coming out to test prices thoroughly. We quote steel bands at 1.15c., with extras as per the steel bar card, and steel hoops at 1.25c., f.o.b. Pittsburgh. On desirable business these prices would be shaded.

Rivets, Nuts and Bolts.—The new demand continues quiet and only for small lots. Prices on rivets are weaker and are being shaded. None of the makers of rivets, nuts and bolts is operating to more than 50 per cent. We quote button-head structural rivets at 1.60c. to 1.65c. and cone-head boiler rivets at 1.70c. to 1.75c., in carload lots, an advance of about $1 a ton over these prices being charged for small lots. Terms, 30 days net, less 2 per cent. for cash in 10 days. Discounts on nuts and bolts are as follows in lots of 300 lb. or over, delivered within a 20c. freight radius of makers' works:

Coach and lag screws	80 and 5%
Small carriage bolts, cut threads	80% off
Small carriage bolts, rolled threads	80 and 5% off
Large carriage bolts	75 and 5% off
Small machine bolts, cut threads	80 and 5% off
Small machine bolts, rolled threads	80 and 10% off
Large machine bolts	75 and 10% off
Machine bolts, c.p.c. & t nuts, small	80% off
Machine bolts, c.p.c. & t nuts, large	75 and 5% off
Square h.p. nuts, blanked and tapped	$6.30 off list
Hexagon nuts	$7.20 off list
C.p.c. and r sq. nuts, blanked and tapped	$6.00 off list
Hexagon nuts, ⅝ and larger	$7.20 off list
Hexagon nuts, smaller than ½ in.	$7.80 off list
C.P. plain square nuts	$5.50 off list
C.P. plain hexagon nuts	$5.90 off list
Semi-fin. hex. nuts, ½ in. and smaller,	85, 10 & 10% off
Semi-fin. hex. nuts, ⅝ in. and larger	85 and 5% off
Rivets, 7/16 x 6½, smaller & shorter	80, 10 & 5% off
Rivets, metallic tinned, bulk	80, 10 and 10% off
Rivets, tin plated, bulk	80, 10 and 10% off
Rivets, metallic tinned, packages	80, 10 and 5% off
Standard cap screws	70, 10 and 10% off
Standard set screws	75, 10 and 10% off

Boiler Tubes.—Aside from a little better demand for locomotive tubes, this market shows no change. The demand for merchant tubes for some time has been very dull, and discounts on both steel and iron tubes are being shaded.

Standard Pipe.—The feeling in the pipe trade is better, and it is believed that within a short time the volume of new business will be heavier. Some large projects involving heavy tonnages of line pipe are under way in gas and oil territories, and some of these will no doubt go through. The general demand for merchant pipe is only fair, and the mills are operating to 50 to 60 per cent. of capacity. Discounts on iron and steel pipe are being well observed.

Coke.—Some furnace operators, whose contracts for coke expire on July 1, are sounding the market for coke for the last half of the year. Three or four of the leading coke operators are holding furnace coke for last half at $2, but consumers say they will not pay above $1.75 per net ton at oven. A Cleveland furnace interest recently bought a round tonnage at the latter

price, and in fact has been buying its entire needs of furnace coke month by month at the same figure. Some merchant coke ovens are being put out this week, and the immediate outlook for the coke trade is discouraging. We quote standard makes of furnace coke for prompt shipment at $1.75 to $1.85, and it is possible that several coke operators would accept $1.85 on coke for last half, but other makers are holding firm to $2. Foundry coke is quoted at $2.40 to $2.50 at oven. The Connellsville Courier reports the output of the upper and lower Connellsville regions for the week ended May 9 as 312,100 tons, an increase of 6490 tons over the previous week.

Old Material.—Consumers are not buying any scrap, being covered for some time ahead. Some are also holding up shipments. The general condition of the scrap trade is thus very unsatisfactory. Prices have gone off slightly on one or two lines, and the whole market is far from being strong. A sale of about 300 tons of cast-iron borings is reported at about $7.75 delivered. Dealers quote, per gross ton, for delivery to consumers' mills in the Pittsburgh and nearby districts that take the same rates of freight as follows:

Selected heavy steel melting scrap, Steubenville, Follansbee, Brackenridge, Sharon, Monessen, Midland and Pittsburgh delivery	$12.00 to $12.25
Ordinary steel melting scrap	11.50 to 11.75
Compressed side and end sheet scrap	11.25 to 11.50
No. 1 foundry cast	11.50 to 11.75
No. 2 foundry cast	10.25 to 10.50
Bundled sheet scrap, f.o.b. consumers' mills, Pittsburgh district	8.75 to 9.00
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	12.75 to 13.00
No. 1 railroad malleable stock	11.00 to 11.25
Railroad grate bars	10.25 to 10.50
Low phosphorus melting stock	14.50
Iron car axles	22.50 to 23.00
Steel car axles	15.50 to 16.00
Locomotive axles, steel	20.00 to 20.50
No. 1 busheling scrap	10.25 to 10.50
No. 2 busheling scrap	7.25 to 7.50
Machine shop turnings	7.75
Old carwheels	11.25 to 11.50
Cast-iron borings	7.75
†Sheet bar crop ends	12.00 to 12.25
Old iron rails	13.75 to 14.00
No. 1 railroad wrought scrap	11.50 to 11.75
Heavy steel axle turnings	8.50 to 8.75
Heavy breakable cast scrap	12.00 to 12.25

†Shipping point.

Chicago

CHICAGO, ILL., May 19, 1914.

In a general way iron and steel conditions show no material change for the week under review, but a close analysis will undoubtedly discover improvement both in sentiment and fact. As a whole specifications were heavier. The fabricating shops have taken a fair amount of work and are feeling more cheerful. Inquiry is better for immediate shipment steel, particularly reinforcing bars, and shows signs of an awakening in connection with third quarter contracts. Figures are now being taken on about 11,000 tons of reinforcing bars for three jobs which are to proceed at once. Scattering orders for rails are being booked. Business men are growing more sanguine of a favorable rate decision, they are discounting the excellent crop outlook and they are looking forward to the end of the half year as a turning point for taking up slack and making a fresh start. There is in this market inquiry for some 8000 or 9000 tons of pig iron, which is a decided improvement. The market presents its most discouraging aspect in connection with prices. Western mills are not hesitating to sacrifice their freight advantage where that is necessary to secure the placing of business. The open quotation for heavy steel products is now 1.28c., Chicago, and it is not any too well established at that figure. Some of the sheet mills are making unusual concessions for immediate specifications.

Pig Iron.—The activity which centered around basic iron appears to have subsided without the transacting of much additional business of importance beyond that previously noted. Inquiry now in the market for figures is largely for foundry iron and some malleable. The interest shown comes mainly from those who purchased conservatively in the first half and are now looking with equal conservatism to their needs of the third quarter. With the exception of one inquiry where the tonnage involved is in the neighborhood of 2500 tons, the prospective business is within the limit of 1000-ton lots. The third quarter is now so closely at hand that producers are no longer optimistic in the hope of securing an advance for that delivery, but are selling at current prices. There is some inquiry in the market for low phosphorus iron. The Southern market is responding more slowly, but a revival of hope that the rates from the South to this territory are to be reduced is held to be an encouraging factor. The last half price for Southern iron has not been established but offers are being solicited on the basis of $10.50, Birmingham, for No. 2 foundry. The following quotations are for iron delivered at consumers' yards, except those for Northern foundry, malleable Bessemer and basic iron, which are f.o.b. furnace and do not include a local switching charge averaging 50c. a ton:

Lake Superior charcoal	$15.75 to $16.75
Northern coke foundry, No. 1	14.75 to 15.00
Northern coke foundry, No. 2	14.00 to 14.50
Northern coke foundry, No. 3	13.75 to 14.00
Southern coke, No. 1 f'dry and 1 soft	15.35 to 15.85
Southern coke, No. 2 f'dry and 2 soft	14.85 to 15.35
Malleable Bessemer	14.00 to 14.50
Standard Bessemer	17.00
Basic	13.25 to 13.50
Low phosphorus	21.50 to 22.25
Jackson Co. and Ky. silvery, 6 per cent.	16.90 to 17.40
Jackson Co. and Ky. silvery, 8 per cent.	17.90 to 18.40
Jackson Co. and Ky. sil'vy, 10 per cent.	18.90 to 19.40

Rails and Track Supplies.—The Great Northern has ordered 3000 tons of rails from the mill at the Soo. The Chicago Elevated Railway has bought 600 tons of girder rails and a similar tonnage has been purchased for the street car system at Evansville, Ind. In addition to these orders, the Pennsylvania Steel Company will furnish the entire 2000 tons of rails for the Detroit Union Traction Company instead of only a part as previously reported. We quote standard railroad spikes at 1.50c. to 1.55c., base; track bolts with square nuts, 2c. to 2.10c., base, all in carload lots, Chicago; tie plates, $26 to $28 net ton; standard section Bessemer rails, Chicago, 1.25c., base; open hearth, 1.34c.; light rails, 25 to 45 lb., 1.25c.; 16 to 20 lb., 1.30c.; 12 lb., 1.35c.; 8 lb., 1.40c.; angle bars, 1.50c., Chicago.

Structural Material.—In this market 6000 box cars are being placed, 3000 each by the Chicago & Northwestern and the Illinois Central. These will go to Western car builders and the steel for underframes to local mills. Nearly 1000 additional cars in miscellaneous lots are also reported as being placed. Bridge shops at Chicago have taken a fair number of contracts in the past few weeks, and while prices for fabricated steel do not appear attractive the plain material has borne a large share of the concessions and fabricators are feeling more cheerful. Contracts noted during the past week include 1426 tons for the Carter White Lead Company, at West Pullman, to the Kenwood Bridge Company; 244 tons for the Chicago, Milwaukee & St. Paul to the Wisconsin Bridge & Iron Company; 316 tons for the Rock Island Lines, to the Morava Construction Company. Plain material purchases by fabricators to cover contracts recently taken have established the market for shapes at 1.28c., Chicago, and in some instances this has not been the last word. It is understood that certain sizes of plain material are available from stock at a local fabricating plant on resale at prices that have not tended to strengthen the situation. We quote for Chicago delivery of plain shapes from mill, 1.28c. to 1.33c.

We quote for Chicago delivery of structural shapes from store 1.75c.

Plates.—The greatest need of the mills in this district still is tonnage. In this respect the situation is not improved. For Chicago delivery from mill we quote 1.25c. to 1.30c.

We quote for Chicago delivery of plates from store 1.75c.

Sheets.—The market for sheets does not so much reflect the condition of the leading producers at Chicago as it does the eagerness of other smaller mills for business. Reports of quotations which represent marked concessions are current where immediate speci-

fications are being sought. Weakness is especially pronounced for galvanized sheets. Some of the financially stronger customers are evincing a receptive mood regarding their third quarter contracts on the basis of prices now being made. We quote for Chicago delivery from mill: No. 10 blue annealed, 1.48c. to 1.53c.; No. 28 black, 1.98c. to 2.03c.; No. 28 galvanized, 2.98c. to 3.03c.

For sheets out of store we quote for Chicago delivery as follows, minimum prices applying on bundles of 25 or more: No. 10 blue annealed, 1.95c.; No. 28 black, 2.45c. to 2.55c.; No. 28 galvanized, 3.50c. to 3.60c.

Bars.—Reinforcing bars are furnishing the largest measure of support to current mill operation. For sewer construction in Minneapolis prices are being asked on 8000 tons; for a building in St. Paul 1500 tons is required, and for the pier at Chicago 1400 tons. The general run of smaller orders totals an additional aggregate of substantial proportions. No change has developed in the implement situation. For bar iron very low prices are rumored and 1.10c., Chicago, is a relatively good price for the maker. We quote for mill shipments as follows: Bar iron, 1.10c.; soft steel bars, 1.28c. to 1.33c.; hard steel bars, 1.30c.; shafting in carloads, 65 per cent. off; less than carloads, 60 per cent. off.

We quote store prices for Chicago delivery: Soft steel bars, 1.65c.; bar iron, 1.65c.; reinforcing bars, 1.65c. base, with 5c. extra for twisting in sizes ½ in. and over and usual card extras for smaller sizes; shafting 60 per cent. off.

Rivets and Bolts.—Except for a slightly larger volume of specifications for rivets, the market has brought out no new features in connection with these products. We quote from mill as follows: Carriage bolts up to ⅝ x 6 in., rolled thread, 80-5; cut thread, 80; larger sizes, 75-5; machine bolts up to ⅝ x 4 in., rolled thread, 80-10; cut thread, 80-5; larger sizes, 75-10; coach screws, 80-15; hot pressed nuts, square head, $6.20 off per cwt.; hexagon, $7 off per cwt. Structural rivets, ½ to 1¼ in., 1.73c. to 1.78c., base, Chicago, in carload lots; boiler rivets, 10c. additional.

We quote out of store: Structural rivets, 2.35c.; boiler rivets, 2.55c.; machine bolts up to ¾ x 4 in., 75-10; larger sizes, 70-10-5; carriage bolts up to ⅝ x 6 in., 75-5; larger sizes, 70-10 off; hot pressed nuts, square head, $6, and hexagon, $6.70 off per cwt.

Cast-Iron Pipe.—The placing of 600 tons of pipe at Valley Junction, Iowa, and about 3000 tons of gas pipe made up the principal business of the week. An award of 1000 tons is being made at St. Louis to-day. Quotations are unchanged.

Old Material.—Stagnation is accentuated with each passing week and in one direction or another prices show further weakness. The market is devoid of interesting developments. The Chicago, Burlington & Quincy Railroad is asking for prices on a list of about 3500 tons of scrap. We quote, for delivery at buyers' works, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton

Old iron rails	$12.75 to $13.25
Old steel rails, rerolling	11.25 to 11.75
Old steel rails, less than 3 ft.	10.50 to 11.00
Relaying rails, standard section, subject to inspection	24.00
Old carwheels	11.50 to 11.75
Heavy melting steel scrap	9.50 to 10.00
Frogs, switches and guards, cut apart	9.50 to 10.00
Shoveling steel	9.00 to 9.50
Steel axle turnings	6.75 to 7.25

Per Net Ton

Iron angles and splice bars	$12.00 to $12.50
Iron arch bars and transoms	12.00 to 12.50
Steel angle bars	9.00 to 9.50
Iron car axles	17.00 to 17.50
Steel car axles	12.25 to 12.75
No. 1 railroad wrought	9.00 to 9.50
No. 2 railroad wrought	8.50 to 8.75
Cut forge	8.50 to 8.75
Steel knuckles and couplers	9.00 to 9.50
Steel springs	9.25 to 9.75
Locomotive tires, smooth	9.75 to 10.00
Machine shop turnings	5.00 to 5.50
Cast borings	4.50 to 5.00
No. 1 busheling	7.50 to 8.00
No. 2 busheling	6.00 to 6.50
No. 1 boilers, cut to sheets and rings	6.50 to 7.00
Boiler punchings	9.25 to 9.75
No. 1 cast scrap	10.00 to 10.25
Stove plate and light cast scrap	9.00 to 9.50
Grate bars	8.75 to 9.25
Railroad malleable	9.00 to 9.50
Agricultural malleable	8.00 to 8.50
Pipes and flues	6.75 to 7.25

Wire Products.—The protracted period of light demand for wire nails has begun to show itself in quotations, and concessions of $1 a ton are reported from prices generally quoted in April. For some classes of wire, deliveries are still a matter of several weeks, but the slackened operations of the semi-finished material mills of the leading interest is a reflection of the disappointing volume in which wire products as a whole are being shipped to consumers. We quote to jobbers as follows: Plain wire, No. 9 and coarser, base, $1.53 to $1.58; wire nails, $1.73 to $1.78; painted barb wire, $1.73 to $1.78; galvanized, $2.13 to $2.18; polished staples, $1.73 to $1.78; galvanized, $2.08 to $2.13, all Chicago.

Hoops and Bands.—The mills are practically on a hand-to-mouth basis and their operating schedule will scarcely carry them for more than 30-day periods. In some instances operations have already been intermittent. There is insufficient business offering to develop any pronounced concessions and we continue to quote for Chicago delivery of bands 1.33c. to 1.38c. and for hoops 1.43c. to 1.48c.

Philadelphia

PHILADELPHIA, PA., May 19, 1914.

The taking of basic pig iron by Eastern buyers in quantities estimated to aggregate at least 70,000 tons has naturally had a beneficial effect on a situation which has been gloomy for weeks. There is regret that the sales were made at prices which show little or no profit to the makers, but satisfaction is felt because of the evident recognition by the purchasers that the market has reached bottom. The hope of furnace representatives now is that the recent weakness has been halted and that better demand and prices may be expected. The activity in basic has been accompanied by not only more transactions in foundry grades but with the taking of larger quantities, indicating that foundry stocks are low. In bars and plain structural shapes a somewhat better demand is reported which also tends to inspire hopefulness, but business in billets, plates and sheets still drags and the optimistic feeling has yet to develop in some quarters. Old materials are quiet.

Iron Ore.—Imports in the week ended May 16 were light, consisting of only 6450 tons of Cuban ore. The present needs of iron makers seem to be amply covered and no new business is mentioned.

Pig Iron.—Buying of basic has been heavy in this district and has held most of the interest, although not overlooked is the fact that there has been a tangible improvement in miscellaneous foundry grades. None of the purchasing was widely distributed. A conservative estimate places the total quantity of basic taken at about 70,000 tons, with the bulk of it taken by two or three buyers. Other estimates place the total at between 75,000 and 80,000 tons. A large part went on the basis of $14, delivered, and not much more was realized for any part. Most encouraging in regard to the buying of basic, and aside from the excellent amount involved, is the feeling that the activity is an acknowledgment on the part of careful buyers that the low point in prices has been reached and that a rebound is next in order. The activity has also caused the comment that some buyers, at least, have faith in the future. Quite general on the part of sellers, however, are expressions of regret that the iron went at so low a price. The heaviest buyer, an Eastern manufacturer of plates, is generally reported to have taken from 30,000 to 50,000 tons, with the former figure probably more nearly correct, for last half delivery. An interest in the Harrisburg district took about 18,000 tons, 6000 tons for third quarter delivery from one seller and 12,000 tons for last half delivery from another. A second consumer in the same district has been negotiating for from 12,000 to 24,000 tons and is understood to have practically closed. Other and smaller deals in basic are reported as closed or pending and some small lots of standard low phosphorus have been bought at $21, delivered here. Sales of eastern Pennsylvania No. 2 X and of miscellaneous irons, while

not widely distributed, have improved both in number and quantities taken in the last week, there having been more transactions in which 400 tons and 500 tons figured, while there was one purchase of 1500 tons of pipe iron. Other deals closed included one of 500 tons of malleable iron. Practically all of this business was done at full prices. In Virginia iron there has been little change, although consumers are showing more interest through inquiries for deliveries over the end of the year, but sellers say they do not see their way clear to contract too far ahead at present prices. A second cargo of Nova Scotia iron has arrived at this port, making 7000 tons altogether so far imported. Many of the jobbing foundries in this territory are running only four or five days a week. The following range of prices represents the general market for near delivery in buyers' yards in this district:

Eastern Penna. No. 2 X foundry	$14.75 to $15.25
Eastern Penna. No. 2 plain	14.50 to 14.75
Virginia No. 2 X foundry	15.55 to 15.75
Virginia No. 2 plain	15.30 to 15.55
Gray forge	13.75 to 14.00
Basic	14.00
Standard low phosphorus	21.00

Ferroalloys.—The reduction of $1 a ton, made last week, which placed both English and German 80 per cent. ferromanganese on the same level at $38, seaboard, is variously regarded here. Some sellers say the reduction was unjustified by conditions here, inasmuch as they believed that the few consumers who might take ferromanganese at this time would pay $39 as quickly as they would $38. No sales at the lower price have been brought out. On the other hand, some sellers say that where English and German could be had at the same price preference would surely be given to the former and it is supposed that the reduction was made to meet the competition of the German product.

Billets.—The market shows no improvement and is dull with the local price unchanged at $22.40 for open-hearth rolling billets, with forging steel at the usual advance of $4 to $5 a ton, according to specification. In cases where consumers have sought to buy steel at exceptionally low prices, under cost in fact, when the freight rates involved were considered, business has been firmly refused.

Structural Material.—Noteworthy items in the way of new business are still lacking here, although there may be mentioned a hotel to be erected at Johnstown and a few small theaters which are scattered about eastern Pennsylvania and which will take up to 300 or 400 tons each. The miscellaneous demand for plain shapes is fairly good, better than other lines of finished products. Where small miscellaneous orders are concerned, 1.30c., Philadelphia, is the quotation, though for highly desirable lots 1.25c. might be taken.

Bars.—Manufacturers have been informed that makers of agricultural equipment have enjoyed an excellent season, some of them the best in their history, despite which they are inclined to be conservative in buying. A local maker of twisted steel reinforcing bars made two sales aggregating 9200 tons on a basis of 1.15c., Pittsburgh, or 1.30c., Philadelphia, and is receiving good inquiries. Plain steel bars in sizable quantities range from 1.25c., Philadelphia, to 1.30c. Iron bars continue dull at 1.20c. to 1.25c., delivered here.

Plates.—Current business is still of the small miscellaneous sort on which 1.30c., Philadelphia, is generally quoted. On large lots 1.25c. or better could be done. In the boat line there is mention of some tugs for the Panama Canal, bids on 1 to 30 having been requested.

Sheets.—Makers in this district are running full this week, but admit that they see little ahead for next week and they may slow down unless orders come along at a better rate. The Philadelphia quotation is unchanged at 1.50c. to 1.55c., delivered, according to quantity, for No. 10 blue annealed sheets. Eastern makers have reduced their prices for delivery on the Pacific coast to meet the competition of middle Western mills.

Old Material.—Purchasing has been light although there has been a better demand for specialties for which better prices are obtained than those listed for the ordinary run of stock. On the whole, there is a better feeling though dealers have no great disposition to sell at existing prices. Two or three reductions are noted. The following quotations about represent the market for deliveries in buyers' yards in this district, covering eastern Pennsylvania and taking freight rates varying from 35c. to $1.35 per gross ton:

No. 1 heavy melting steel	$10.75 to $11.00
Old steel rails, rerolling	12.25 to 12.75
Low phosphorus heavy melting steel scrap	14.50 to 15.00
Old steel axles	14.00 to 14.50
Old iron axles (nominal)	20.00 to 21.00
Old iron rails	15.00 to 15.50
Old carwheels	11.75 to 12.25
No. 1 railroad wrought	12.50 to 13.00
Wrought-iron pipe	10.00 to 10.50
No. 1 forge fire	8.00 to 8.50
Bundled sheets	8.00 to 8.50
No. 2 light iron	5.00 to 5.50
No. 2 busheling	8.00 to 8.50
Wrought turnings	7.50 to 8.00
Cast borings	8.00 to 8.50
No. 1 cast	12.00 to 12.50
Grate bars, railroad	8.50 to 9.00
Stove plate	8.50 to 9.00
Railroad malleable	9.00 to 9.50

Coke.—Prompt furnace coke is a trifle easier at $1.75 to $1.90 per net ton at oven, the lower figure having been offered by makers of a good grade. Contract furnace coke continues firm at $2. The books of one important maker of foundry coke is open for contracts into next year on a basis of $2.95 per net ton at oven and sales have been made on that basis. Prompt foundry coke is quoted at $2.35 to $2.50 per net ton at oven. Freight rates to this city from the producing districts are as follows: Connellsville, $2.05; Mountain, $1.65; Latrobe, $1.85.

Boston

BOSTON, MASS., May 19, 1914.

Old Material.—Transactions are still on a small scale. Dealers are waiting and watching, in the hope that some influence will exert itself to cause an improvement. Prices have not altered in the week. The quotations given below are based on prices offered by the large dealers to the producers and to the small dealers and collectors, per gross ton, carload lots, f.o.b. Boston and other New England points which take Boston rates from eastern Pennsylvania points. In comparison with Philadelphia prices the differential for freight of $2.30 a ton is included. Mill prices are approximately 50c. a ton more than dealers' prices:

Heavy melting steel	$8.25 to $8.50
Low phosphorus steel	13.75 to 14.75
Old steel axles	13.25 to 13.75
Old iron axles	21.25 to 21.75
Mixed shafting	12.00 to 12.25
No. 1 wrought and soft steel	9.00 to 9.25
Skeleton (bundled)	5.50 to 5.75
Wrought-iron pipe	7.50 to 7.75
Cotton ties (bundled)	6.00 to 6.25
No. 2 light	3.75 to 4.25
Wrought turnings	5.00 to 5.50
Cast borings	5.00 to 5.50
Machinery, cast	11.25 to 11.50
Malleable	8.00 to 8.25
Stove plate	7.75 to 8.00
Grate bars	5.25 to 5.50
Cast-iron carwheels	11.00 to 11.25

Cleveland

CLEVELAND, OHIO, May 19, 1914.

Iron Ore.—Few sales are being made and these only in small lots to fill out requirements for part of the season. Low-grade ores are being offered at 10c. and 15c. a ton below regular prices. Conditions in the lake trade are very unsatisfactory. The ore movement so far this season has not been large enough to provide cargoes for vessels operated by shippers and many boats owned by shippers have not yet gone into commission. A few boats that started have been laid up to wait for improvement in conditions. We quote prices as follows: Old range Bessemer, $3.75; Messaba Bessemer, $3.50; old range non-Bessemer, $3.00; Mesaba non-Bessemer, $2.85.

Pig Iron.—The market at last shows indications of taking on some life. Quite a few inquiries have come out for foundry iron in lots ranging from a few hundred to 2000 tons for delivery in the last half, and

while an active buying movement is not expected, orders for a moderate tonnage for that delivery will probably be placed within the next two weeks. It is expected that what buying is done for the last half will be to cover only minimum requirements as conditions in the foundry trade appear to show no improvement among either the gray-iron, malleable or steel foundries. One interest is quoting No. 2 foundry at $13.25, Cleveland furnace, for outside shipment through last half and another producer which has been making the nominal quotation of $14 has not yet named prices, but $13.25 will probably be the ruling last half quotation for the present. Another lake furnace is quoting $13.50 for the third quarter. We note a sale to Cleveland consumers of 400 tons of No. 1 Southern at $10.75 and 600 tons of Ohio silvery on the basis of $16, furnace, both orders for the last half. A northern Ohio stove manufacturer, who had an inquiry out for 750 tons of No. 2 Southern for the remainder of the year has purchased 250 tons at $10.50. We quote delivered Cleveland as follows:

Bessemer	$14.90
Basic	$13.75 to 13.90
Northern No. 2 foundry	14.25
Southern No. 2 foundry	14.85
Gray forge	13.50
Jackson Co. silvery, 8 per cent. silicon	17.55
Standard low phosphorus, Valley furnace	26.50

Coke.—The market is rather weak and the $1.75 price for standard furnace coke for prompt shipment has become more general. Producers are still asking $2 for the last half. There is no new demand for either grade. We quote 72-hr. foundry coke at $2.40 to $2.65.

Finished Iron and Steel.—Sentiment in the steel trade shows a general improvement, but so far this has not been accompanied by better volume of orders. The structural outlook has improved somewhat, although the current demand is light. The demand for reinforcing bars is fairly good. Bids will be received early in June for a large steel and concrete warehouse to be erected by the W. Bingham Company, Cleveland, that will take 1500 tons of structural material and a round tonnage of steel bars. The Burger Iron Company, Akron, has taken 125 tons of structural material for a garage in Barberton and has placed an order for 1500 tons of steel for this and other work taken recently and for stock. The demand for bar iron continues very light and local mills are running but a small portion of the time. We quote iron bars at 1.20c., Cleveland. The finishing mills of the Republic Iron & Steel Company at Youngstown, Ohio, which were shut down last week, started out Monday at about 65 per cent. of capacity. The demand for sheets is holding up fairly well and prices are being quite generally maintained at 1.85c. for No. 28 black and 2.85c. for No. 28 galvanized. The Lackawanna Steel Company has taken an order for 250 tons of sheet steel piling for use in Pittsburgh. Warehouse prices are unchanged at 1.80c. for steel bars and 1.90c. for plates and structural material.

Bolts and Rivets.—The bolt and nut market shows an improvement in the volume of inquiry, considerable inquiry having come out for last half contracts. Prices appear to be somewhat firmer, although there is slight shading. Among the inquiries is one for 3000 tons of very large bolts and nuts for use in East River tunnel work in New York, delivery to extend over a period of about 2½ yr. Rivets are quoted at 1.55c. for structural and 1.65c. for boiler rivets for round lots. We quote discounts as follows: Common carriage bolts, ⅝ x 6 in. smaller or shorter, rolled thread, 80 and 5 per cent.; cut thread, 80 per cent.; larger or longer, 75 and 5 per cent.; machine bolts with h.p. nuts, ⅝ x 4 in., smaller or shorter, rolled thread, 80 and 10 per cent.; cut thread, 80 and 5 per cent.; larger or longer 75 and 10 per cent.; coach and lag screws, 80 and 15 per cent.; square h.p. nuts, blank or tapped, $6.30 off; hexagon h.p. nuts, blank or tapped, $7.20 off; c. p. c. and t. square nuts, blank or tapped, $6 off; hexagon, ⅝ in. and larger, $7.20 off; 9-16 in. and smaller, $7.80 off; semi-finished hexagon nuts, ⅝ in. and larger, 85, 10 and 5 per cent.; 9-16 in. and smaller, 85, 10, 10 and 5 per cent.

Old Material.—Practically no business is being done in scrap. Local mills have a large amount of material on hand and are holding back on shipments. One Valley mill is offering $11.50 for a limited amount of heavy melting steel scrap for June delivery, but other Valley mills have large stocks on hand. The local quotations on heavy melting steel has been reduced 25c. a ton and railroad malleable is weaker. We quote f.o.b. Cleveland as follows:

Per Gross Ton	
Old steel rails, rerolling	$11.50 to $12.00
Old iron rails	13.50 to 14.00
Steel car axles	15.00 to 15.25
Heavy melting steel	10.00 to 10.50
Old carwheels	11.50 to 12.00
Relaying rails, 50 lb. and over	23.00 to 25.00
Agricultural malleable	8.50 to 9.00
Railroad malleable	10.25 to 10.50
Light bunded sheet scrap	7.50 to 8.00

Per Net Ton	
Iron car axles	$17.25 to $18.25
Cast borings	5.75 to 6.25
Iron and steel turnings and drillings	5.25 to 5.50
Steel axle turnings	6.75 to 7.25
No. 1 busheling, new	8.50 to 8.75
No. 1 busheling, old	8.00 to 8.25
No. 1 railroad wrought	9.50 to 10.00
No. 1 cast	10.50 to 10.75
Stove plate	7.50 to 8.00

Cincinnati

CINCINNATI, OHIO, May 20, 1914.—(*By Wire.*)

Pig Iron.—A few more inquiries have come out from under cover, the largest being for approximately 2000 tons of Northern foundry iron for a central Indiana melter for last half shipment. The Louisville & Nashville Railroad expects to buy 700 tons of analysis iron for the same delivery and there are several inquiries from both the Chicago and St. Louis districts that are being figured on. Malleable users are slow in making purchases, while a few are quietly feeling the market there is no definite business before the trade. Sales of foundry iron are curtailed to small lots, and one for 400 tons of Northern iron to an Ohio consumer was a matter of as much interest as a contract for 10 times that tonnage would receive under normal conditions. It is reported on good authority that the furnaces in the Ironton district are extremely loath to contract for a supply of ore, even at the reduced price. While several have enough ore under contract to run them through the summer, unless they make arrangements for a further supply their fall and winter operations will be necessarily reduced to a low minimum. Prices in both the South and the Hanging Rock district are unchanged, but it is stated that Southern iron can be bought at $10.50, Birmingham, for delivery through the year. Based on freight rates of $3.25 from Birmingham and $1.20 from Ironton we quote, f.o.b. Cincinnati, as follows:

Southern coke, No. 1 f'dry and 1 soft	$14.25 to $14.75
Southern coke, No. 2 f'dry and 2 soft	13.75 to 14.25
Southern coke, No. 3 foundry	13.25 to 13.75
Southern No. 4 foundry	12.75 to 13.25
Southern gray forge	12.25 to 12.75
Ohio silvery, 8 per cent. silicon	17.20 to 17.70
Southern Ohio coke, No. 1	15.70 to 16.20
Southern Ohio coke, No. 2	14.70 to 15.20
Southern Ohio coke, No. 3	14.45 to 14.70
Southern Ohio malleable Bessemer	14.70 to 15.20
Basic, Northern	14.70 to 15.20
Lake Superior charcoal	16.25 to 17.25
Standard Southern carwheel	27.25 to 27.75

(*By Mail*)

Coke.—The pig-iron producers in the Hanging Rock district are not yet disposed to make provision for a last half supply. With the exception of one concern all will be compelled to come into the market at an early date. The consumption of foundry coke has been much below normal for some time, and, as a consequence, foundry shipments have been curtailed. Coke due on old contracts will be sufficient to take care of many melters through the next three months. Furnace coke prices are unchanged, being quoted around $1.85 per net ton at oven for prompt shipment and from that figure to $2 on contract. Foundry coke is around $2.50 to $2.80 in all three fields, but it is rumored that Pocahontas prices are still slightly below quotations in other districts.

Finished Material.—Several contracts for bridges are to be placed in this vicinity soon, but there is still a slack demand for structural shapes for other pur-

poses. Reinforcing concrete bars are also slow, due principally to the existing and impending labor disputes in this city. However, mill agencies are booking some business from the outside. Steel bars and structural shapes are quoted from stock around 1.75c. and 1.85c. respectively. There is a much better sentiment expressed as to sheets, although orders continue to come in slowly. We quote No. 28 black sheets at 2c. to 2.05c., and galvanized at 3c. to 3.05c., f.o.b. Cincinnati or Newport, Ky. Railroad track supplies show a slight improvement.

Old Material.—But little heavy scrap is moving; the lighter grades are also in poor demand. A comparatively small tonnage of cast borings and steel turnings has lately changed hands, but general business is unsatisfactory. The minimum figures given below represent what buyers are willing to pay for delivery in their yards, southern Ohio, and Cincinnati, and the maximum quotations are dealers' prices f.o.b. at yards:

Per Gross Ton

Bundled sheet scrap	$6.75 to $7.25
Old iron rails	11.75 to 12.25
Relaying rails, 50 lb. and up	19.75 to 20.25
Rerolling steel rails	10.75 to 11.25
Melting steel rails	9.25 to 9.75
Old carwheels	10.25 to 10.75

Per Net Ton

No. 1 railroad wrought	$8.75 to $9.25
Cast borings	4.50 to 5.00
Steel turnings	4.50 to 5.25
Railroad cast scrap	9.25 to 9.75
No. 1 machinery cast scrap	10.25 to 11.25
Burnt scrap	6.00 to 6.75
Old iron axles	16.75 to 17.25
Locomotive tires (smooth inside)	9.75 to 10.25
Pipes and flues	6.25 to 6.75
Malleable and steel scrap	7.25 to 7.75
Railroad tank and sheet scrap	5.25 to 5.75

Buffalo

BUFFALO, N. Y., May 19, 1914.

Pig Iron.—Consumers are taking a little more interest and there is some broadening of inquiry, both for current and future needs. The current demand has been chiefly for small lots. About 5000 tons, all grades, were placed in the week. Prices are still maintained as follows, f.o.b. Buffalo, 25c. per ton being added for Buffalo city delivery:

No. 1 foundry	$14.00 to $14.25
No. 2 X foundry	13.50 to 14.00
No. 2 plain	13.25 to 13.75
No. 3 foundry	13.00 to 13.25
Gray forge	13.00
Malleable	13.75 to 14.25
Basic	13.75 to 14.25
Charcoal, regular brands and analysis	15.75 to 16.75
Charcoal, special brands and analysis	20.50

Old Material.—The market is looking a little better with increasing interest and inquiry on the part of some users. Dealers are inclined to pick up odd lot tonnages to be in readiness to meet the expected increase in demand, believing that the market will be stronger in the near future. The indications have not yet affected price schedules, however, and we quote as follows, per gross ton, f.o.b. Buffalo:

Heavy melting steel	$10.00 to $10.50
Low phosphorus steel	14.50 to 15.00
Boiler plate sheared	11.50 to 12.00
No. 1 railroad wrought scrap	11.00 to 11.50
No. 1 railroad and machinery cast	11.50 to 12.00
Old steel axles	12.75 to 13.25
Old iron axles	21.50 to 22.00
Old carwheels	11.50 to 12.00
Railroad malleable	10.25 to 10.75
Machine shop turnings	5.25 to 5.75
Heavy axle turnings	7.50 to 8.25
Clean cast borings	6.00 to 6.50
Old iron rails	15.00 to 15.50
Locomotive grate bars	9.50 to 10.00
Stove plate (net ton)	9.75 to 10.00
Wrought pipe	7.50 to 8.00
Bundled sheet scrap	6.25 to 6.50
No. 1 busheling scrap	8.25 to 8.75
No. 2 busheling scrap	5.75 to 6.25
Bundled tin scrap	10.50

Finished Iron and Steel.—The principal development has been an increased demand for structural material. Wire and wire products are reported quiet, but considerable inquiry is noted for tin plate and black sheets for delivery over the last half. The Buffalo Corrugated Bar Company was low bidder for the 400 tons reinforcing bars for the J. W. Clement printing plant, Buffalo. The Lackawanna Bridge Company, Buffalo, has 400 tons from the Grand Trunk Railroad for grade separation work at Detroit, and Lewis F. Shoemaker & Co. have 100 tons from New York Central for grade crossing elimination bridge at Hertel avenue, Buffalo. The Parker Company, New York City, has the general contract for the new Hamilton Hotel, Hamilton, Ont., requiring 1400 tons. Bids are to be taken next week for about 100 tons for the Temple Beth Zion auditorium and school building, Buffalo, and 150 tons for the Reiman Amusement Palace, Buffalo.

Henry Wolkind, 468-478 Louisiana street, Buffalo, N. Y., dealer in scrap iron and steel, is installing a $5000 baling or bundling press furnished by the Hydraulic Press Mfg. Company, Mt. Gilead, Ohio. Other improvements will include a motor crane, a large size scale, an inclined bundle carrier and an eight-car switch from the Lehigh Valley Railroad. Henceforth the business will be confined entirely to handling scrap from can and other stamping factories. To take care of the anticipated increase in business both night and day shifts will be used.

Birmingham

BIRMINGHAM, ALA., May 18, 1914.

Pig Iron.—While there has been no general change in the market, some bright spots have appeared. One maker sold over 1000 tons the past week in 300-ton lots and smaller. The price for spot delivery obtained was $10.50 to $10.75, and some for third quarter delivery brought $11. It was all in strictly Southern territory. Another sold 1250 tons on the basis of $10.75. This was for spot and July delivery. The market continues to range from $10.50 spot to $11 for forward delivery, it being possible, however, to cover forward iron at the lower price if a part of the spot order. The leading interest is reported as extremely inactive in the selling market. Inquiries are said to be better by some and no better by others. The general impression is that a good-sized buying movement is to be expected at an early date. Some believe it will start with still lower prices and large purchases by the pipe interests and then an advance, while others are hopeful that the bottom has been reached. There will be an early movement of 2000 tons of iron from the Ensley plant of the leading interest to Melbourne, Australia. There has been a slight increase in foundry operations, notably at the Gadsden car works, which has gone on full force, and this has resulted in demands for spot iron in rather numerous instances. We quote, per gross ton, f. o. b. Birmingham furnaces, as follows:

No. 1 foundry and soft	$11.00 to $11.50
No. 2 foundry and soft	10.50 to 11.00
No. 3 foundry	10.00 to 10.50
No. 4 foundry	9.75 to 10.25
Gray forge	9.50 to 10.00
Basic	10.25 to 10.75
Charcoal	23.25 to 23.75

Cast-Iron Pipe.—No improvement is seen in the water and gas pipe trade. Plants are operating on comparatively short time, which enables them to prevent accumulations. Recent orders are mostly for filling in. The sanitary pipe factories are still reasonably busy. We quote, per net ton, f. o. b. pipe works yards, as follows: 4-in., $20.50; 6-in. and upward, $18.50, with $1 added for gas pipe.

Coal and Coke.—While mines are still operating at 60 to 75 per cent. capacity, the prospect is better in several directions. The Tennessee Company and the Taylor Coal Company, of Chicago, are contesting for the Government contract soon to be awarded at New Orleans for furnishing vessels with 10,000 tons of coal per month. Coke is dull again, even with the limited output. Prices remain about the same. We quote, per net ton, f. o. b. oven, as follows: Furnace coke, $2.50 to $2.85; foundry, $3 to $3.40.

Old Material.—Scrap is moving slowly and only in small quantities. We quote, per gross ton, f. o. b. dealers' yards, as follows:

Old iron axles	$14.50 to $15.00
Old steel axles	14.50 to 15.00
Old iron rails	13.00 to 13.50
No. 1 railroad wrought	10.00 to 11.00
No. 2 railroad wrought	8.50 to 9.00
No. 1 country wrought	9.00 to 10.00
No. 2 country wrought	8.00 to 9.00
No. 1 machinery cast	9.50 to 10.00
No. 1 steel scrap	8.00 to 8.50
Tram carwheels	9.50 to 10.00
Standard carwheels	10.50 to 11.00
Stove plate	8.00 to 8.50

San Francisco

SAN FRANCISCO, CAL., May 12, 1914.

Large-scale buying has been restricted so long that immediate consuming demands are closely reflected in current purchases. In several lines the aggregate tonnage appears to be very little below normal, but the expense of handling many small orders is out of proportion to the volume, while mill prices on most lines are very low. Resale prices are such as to discourage the carrying of stock by jobbers. Some have been considering larger purchases, but prefer to await the opening of the Panama Canal. Extremely low prices are quoted on some foreign products, but few buyers are willing to take the quantities necessary for importation.

Bars.—The jobbing movement of soft steel bars is keeping about up to the average for the season, and a fair tonnage is being taken by large consumers, though there are no single inquiries of much importance. Offers have lately been made of German bars on steamer, San Francisco, at 1.30c., the lowest figure yet quoted; but there is still a considerable tonnage to come under old contracts, and few buyers take an interest in such offerings. About the best that can be done on American bars is 1.65c. for water shipment. Considerable foreign reinforcing steel has been sold here, and the present demand is light.

Structural Material.—Last month's building record was unsatisfactory in most coast cities. Local fabricators have been busier of late, but current contracts will soon be completed. Low figures still prevail. A number of small jobs have been figured in the last week, but few have closed. The Central Iron Works will fabricate about 150 tons for a building for A. O. Stewart, and the same owner is taking figures on another building of about the same size. The Ralston Iron Works has a contract for work in the Sonoma County jail. Figures have just been taken on a 15-story building at Pine and Stockton streets, about 500 tons, and plans are out for an auditorium on Ellis street, about 350 tons. The Berkeley postoffice job has been taken by the Pacific Rolling Mill. Inquiries are expected for a small tonnage for the Alameda County infirmary and for a small hotel at Third and Townsend streets. Preliminary plans have been approved for the local public library. Financial arrangements are being made for an eight-story building for the Sacramento Chamber of Commerce.

Rails.—Small inquiries for light rails continue fairly numerous and several sales have been made, but exceptionally low prices have been quoted, possibly with a view to keeping out foreign competition. There has been some inquiry for standard sections, but little business has been done.

Plates.—Requirements for construction work continue large and some new inquiries are coming out, in addition to the steady movement on old contracts. A fair tonnage is going into shipbuilding and marine repairs, but the largest requirements are in connection with the expansion of oil storage and refinery facilities. The American Gasoline Company has just let a contract for 2,000,000-bbl. tanks at Martinez. Jobbing business with small consumers is quiet.

Sheets.—While the tonnage on specifications is fair new business of late has been rather quiet, and all buyers are evidently working close to requirements. Competition for all desirable business is unusually keen. It is reported that a steamer from Antwerp will arrive shortly with 11,950 boxes of tin plates.

Standard Pipe.—The total tonnage of smaller sizes moving through regular jobbing channels does not appear to be below normal, activity in the country offsetting the local dullness, though the condition of resale prices causes general dissatisfaction. Some waterworks inquiries are appearing. The town of Escondido, Cal., has just taken figures on a water system, in which nine miles of steel pipe, 2, 4 and 6 in., will be used. The town of Edmonds, B. C., will take bids June 1 for about 10 miles of lap weld pipe.

Cast-Iron Pipe.—Numerous small contracts are coming out, but there is nothing of special interest in immediate prospect. The city of Los Angeles has just taken bids for 200 tons and the Escondido waterworks will require about 500 tons. Wickenburg, Ariz., will take figures for a small lot May 22. Butte, Mont., has placed a good sized order with the Washington Pipe & Foundry Company, Spokane.

Pig Iron.—Foundry conditions show little improvement, and such melters as are not supplied on old contracts are buying merely from hand to mouth. Current prices on iron from store show a wide range, but most of the stock is in strong hands. About $22 to $23 is said to have been paid in some cases for grades corresponding to No. 1 foundry iron, but there is no definite standard of values on spot offerings. Southern iron is entirely nominal, conditions being unfavorable for any sales in this market. The weakness of the English market is reflected in quotations for current loading, No. 1 Middlesbrough being offered at $19.50 to $20 per gross ton, on sailing vessel, San Francisco. A fair tonnage is being booked at these figures.

Coke.—Most foundries are still well supplied, but the local yards are getting a fair business in small orders and continue to hold prices at $13 to $14 per net ton. Consumers are beginning to make provision for fall requirements, and some German Syndicate coke has been taken for current loading at about $10 per gross ton.

Old Material.—Little attention is given to any description of scrap at present, owing to the general curtailment among manufacturing industries, and values are largely nominal. There is a limited demand for cast-iron scrap, which is still held at about $16 per net ton, but consumers of wrought iron and steel melting scrap continue to hold off.

St. Louis

ST. LOUIS, MO., May 18, 1914.

Pig Iron.—Another purchase of basic iron, 6000 tons of Northern, has added to confidence in this market that renewed buying may be expected from other sources within the next few weeks. The purchaser was a large steel casting company, which by this purchase brings its total of the past ten days or so up to 21,000 tons and evidences the belief of its purchasing department that the low spot has been reached and that new demand is near. Other buying continued to be of the special lot order and nothing larger in quantity than carload to 100-ton lots is reported.

Old Material.—Dealers are buying only such lots as look speculatively good. Consumers are in numerous instances refusing to take scrap contracted for. The railroads are letting old material go at practically whatever prices are offered. We quote dealers' prices, f.o.b. St. Louis, as follows:

Per Gross Ton	
Old iron rails	$10.50 to $11.00
Old steel rails, rerolling	10.50 to 11.00
Old steel rails, less than 3 feet	10.00 to 10.50
Relaying rails, standard section, subject to inspection	21.00 to 23.00
Old carwheels	10.50 to 11.00
No. 1 railroad heavy melting steel scrap	9.75 to 10.25
Shoveling steel	7.75 to 8.25
Frogs, switches and guards cut apart	9.75 to 10.25
Bundled sheet scrap	4.50 to 5.00

Per Net Ton	
Iron angle bars	$10.00 to $10.50
Steel angle bars	8.00 to 8.50
Iron car axles	16.75 to 17.25
Steel car axles	11.75 to 12.25
Wrought arch bars and transoms	11.25 to 11.75
No. 1 railroad wrought	7.75 to 8.25
No. 2 railroad wrought	7.25 to 7.75
Railroad springs	8.25 to 8.75
Steel couplers and knuckles	8.50 to 9.00
Locomotive tires, 42 in. and over, smooth	9.00 to 9.50
No. 1 dealers' forge	7.25 to 7.75
Mixed borings	3.25 to 3.75
No. 1 busheling	7.00 to 7.50
No. 1 boilers, cut to sheets and rings	5.25 to 5.75
No. 1 cast scrap	9.00 to 9.50
Stove plate and light cast scrap	7.50 to 8.00
Railroad malleable	7.00 to 7.50
Agricultural malleable	6.50 to 7.00
Pipes and flues	5.00 to 5.50
Railroad sheet and tank scrap	5.25 to 5.75
Railroad grate bars	6.75 to 7.25
Machine shop turnings	4.25 to 4.75

Coke.—By-product coke is moving more freely than the beehive product, but at about the Connellsville oven prices.

Finished Iron and Steel.—Among contracts closed are: 600 tons for a lumber mill, 400 tons for a new plant for the St. Louis Screw Company and 400 tons for the Missouri State Life Building at St. Louis. Fabricators continue to prefer to buy from warehouse, though quick shipment is offered by the mills. One or two smaller mills are reported as quoting 1.10c. Pittsburgh. Vehicle and agricultural interests are continuing to work off stock and are taking new material, chiefly for special requirements.

New York

NEW YORK, May 20, 1914.

Pig Iron.—The amount of inquiry for foundry iron has increased in the past week and several lots of 300 to 500 tons are pending in this district. In New Jersey a 3000-ton inquiry has been before the trade for several weeks. It was expected that most if not all of this iron would be closed this week. Buffalo furnaces, which have been asking $13.50 for No. 2 X foundry were not in the competition. The silicons specified represented both No. 1 and No. 2 plain irons. On the latter about $13.75 Lehigh Valley furnace is the current price. The large purchases of basic iron in eastern Pennsylvania have affected the general pig-iron situation favorably, but the price, which was for the most part $14 delivered, was somewhat lower than the average price of the last considerable amount of basic bought for Eastern delivery. Current inquiry is for fairly prompt delivery in some cases while in others third quarter and second half delivery is called for. In referring to the improved feeling under the better inquiry of the past two weeks, it should be said that there is very keen competition for pending business. We quote Northern iron for tidewater delivery as follows: No. 1 foundry, $15 to $15.25; No. 2 X, $14.65 to $15; No. 2 plain, $14.40 to $14.75; Southern iron, $15 to $15.25 for No. 1 and $14.75 to $15 for No. 2.

Ferroalloys.—The reduction in price of English 80 per cent. ferromanganese to $38, seaboard, last week, was probably made to bring it to an equality with the German product which is still selling at $38, seaboard. Actual sales or inquiries, however, are scarce. For 50 per cent. ferrosilicon there are a few inquiries and sales of small or carload lots, the quotations remaining at $71 to $73, Pittsburgh, according to the amount asked for.

Finished Iron and Steel.—The volume of business continues at the rate of recent weeks, and a better feeling noticeable is therefore not due to an expansion but to a realization that every day brings the expected buying movement that much nearer. Quite a variation in quotations is noted, with 1.10c., Pittsburgh basis, ruling, at least for plates and shapes, for anything like attractive business to the mills or in transactions with usually large buyers, but 1.15c. for the bulk of new business. Where quotations of 1.15c. have been made for sizable inquiries, the quoter has not expected to receive the order anyway, and odd prices are still learned of, such as less than 50c. a ton under the general market. In the structural field the Boston & Maine will take bids for 2500 tons at Saratoga Junction, N. Y., on May 26, and is also inquiring for 200 tons for a bridge in New Hampshire. A decision is expected shortly on 1000 tons for the Western Maryland. Contract lettings include 300 tons for the Standard Oil Company in Brooklyn and 200 tons for a parochial school, 183rd street and Washington avenue, both to Levering & Garrigues Company; 225 tons for school No. 95, Brooklyn, and 150 tons for the Lafayette school, Newark, both the Hedden Iron Construction Company; 650 tons for a pier at Atlantic City, to the McClintic-Marshall Company; 200 tons for the Eagle Brewery, Utica, N. Y., to the Utica Steam Engine & Boiler Company; 100 tons for a public library, West 126th street, to the George A. Just Company; 200 tons for the Pennsylvania, near Baltimore, to the American Bridge Company, and 450 tons for the Goldenberg store, Washington, to C. A. Schneider's Sons. Fabrication of the 2500 to 3000 tons of plate pipe work in Brooklyn, mentioned last week, is to be undertaken by the T. A. Gillespie Company and the plates are to be furnished by an Eastern mill. In railroad cars the Denver & Rio Grande has placed 500 gondolas with the Pressed Steel Car Company, the St. Louis, Brownsville & Mexico 700 box cars, probably with the American Car & Foundry Company, the Missouri, Kansas & Texas 200 ballast cars with the American Car & Foundry Company, and the Chicago, Milwaukee & St. Paul 500 box cars with its own shops. The Seaboard has entered the market for 400 box cars and 45 passenger equipment. We quote mill shipments of steel bars at 1.15c. Pittsburgh, or 1.31c. New York; plates and structural, 1.10c. to 1.15c. Pittsburgh, or 1.26c. to 1.31c., New York, and iron bars at 1.22½c. to 1.27½c., New York. For lots from store we quote iron and steel bars at 1.80c. to 1.85c., New York, and plates and shapes, at 1.85c. to 1.90c.

Cast-iron Pipe.—Manufacturers feel some encouragement over a perceptible improvement in inquiry. More buyers of pipe are becoming impressed with the belief that prices are not likely to be lower and that it would be well to cover requirements for this season's extensions while they are still able to buy so cheaply. Perth Amboy, N. J., opens bids on 2500 tons of 30-in. today. Troy, N. Y., opened bids on 160 tons yesterday. The Warren Foundry & Machine Company has been notified that it has been awarded the contract for about 1675 tons of 30-in. for San Diego, Cal. The private buying of the past week has shown an increase over immediately preceding weeks. Competition is keen for such business as is coming up and prices show no advance as yet. Carload lots of 6-in. are to be had at $20.50 to $21, per net ton, tidewater.

Old Material.—With the exception of sales of a few thousand tons of heavy melting steel, the general market for scrap has been exceedingly quiet. Rolling mills and foundries have taken little or nothing the past week. A better feeling prevails, however, and the market shows some disposition to become firmer. Quite a demand has sprung up for relaying rails. The following quotations, per gross ton, New York, are continued by dealers:

Old girder and T rails for melting	$8.00 to	$8.50
Heavy melting steel scrap	8.00 to	8.50
Relaying rails	21.50 to	22.00
Rerolling rails	10.00 to	10.50
Iron car axles	17.50 to	18.00
Steel car axles	11.75 to	12.25
No. 1 railroad wrought	10.00 to	10.50
Wrought-iron track scrap	9.00 to	9.50
No. 1 yard wrought, long	8.50 to	9.00
No. 1 yard wrought, short	8.00 to	8.50
Light iron	3.25 to	3.50
Cast borings	5.75 to	6.00
Wrought turnings	5.50 to	5.75
Wrought pipe	8.00 to	8.25
Carwheels	10.00 to	10.50
No. 1 heavy cast, broken up	10.50 to	11.00
Stove plate	7.50 to	8.00
Locomotive grate bars	6.00 to	6.25
Malleable cast	7.25 to	7.75

British Markets Still Halting

Cleveland Pig Iron Tightly Held, but Buying Is Deferred

(*By Cable*)

LONDON, ENGLAND, May 20, 1914.

Cleveland pig iron is very tightly held and available warrants are largely under control. Buying continues reserved, the markets waiting a lead, which may come from Germany, where, owing to the prospects of syndication of bars and other finished products and the prolongation of the Steel Works Union in extended form until 1921, prices are now hardening. The Standard Oil purchase of tin plates last week was 260,000 boxes for July-December delivery, the price stated being equal to 12s. 3d. ($2.98), Wales, for quarters. German mills are reported to be holding a big stock. Receipts of tin plates at Swansea the past week were 118,000 boxes and shipments 98,000 boxes; stocks are 268,000 boxes. The number of furnaces in blast in Scotland, Cleveland and Cumberland is 168, unchanged from last week. Stocks of pig iron in Connal's stores are 92,268 gross tons, against 91,915 tons a week ago. We quote as follows:

Tin plates, coke, 14 x 20, 112 sheets, 108 lb., f.o.b. Wales, 12s. 4½d. ($3.01), against 12s. 6d. ($3.04) a week ago.

The following prices are per ton of 2240 lb.:

Cleveland pig-iron warrants (Tuesday), 51s. 4½d. ($12.50).

No. 3 Cleveland pig iron, makers' price, f.o.b. Middlesbrough, 51s. 7½d. ($12.56).

Hematite pig iron, f.o.b. Tees, 61s. 3d. ($14.90), against 61s. 6d. ($14.96) a week ago.

Sheet bars (Welsh), delivered at works in Swansea Valley, £4 10s. ($21.89).

Steel bars, export, f.o.b. Clyde, £5 15s. ($27.98).

Steel joists, 15-in., export, f.o.b. Hull or Grimsby, £5 12s. 6d. ($27.37).

Steel ship plates, Scotch, delivered local yards, £5 17s. 6d. ($28.59).

Steel black sheets, No. 28, export, f.o.b. Liverpool, £8 15s. ($42.58).

Steel rails, export, f.o.b. works port, £5 12s. 6d. ($27.37).

The following prices are per export ton of 1015 kilos, equivalent to 2237.669 lb.:

German sheet bars, f.o.b. Antwerp, nominal.

German 2-in. billets, f.o.b. Antwerp, 73s. ($17.75).

German basic steel bars, f.o.b. Antwerp, £4 2s. to £4 3s. ($19.95 to $20.19).

German joists, f.o.b. Antwerp, £5 2s. to £5 5s. ($24.82 to $25.55).

Freight rates from Antwerp to New York, Boston, Philadelphia and Baltimore, per 1000 kilos (2204 lb.), are about as follows: Billets, blooms and bars, up to 20 ft., 9s. to 10s. ($2.19 to $2.43). Iron and steel sheets, 11s. to 12s. 6d. ($2.68 to $3.04). Beams up to 30 ft., 12s. 6d. ($3.04).

German Market Unimproved

Leading Makers Despondent, but Expansion of Capacity Continues

BERLIN, May 7, 1914.

At the spring meeting of the Verein Deutscher Eisenhüttenleute last week the leading director of the great Phönix company gave a very despondent view of the market. He expressed fear that the worst of the present depression is still to come. The Steel Works Union held a meeting yesterday to discuss the proposal put forward by the Rheinische Stahlwerke, as mentioned in this correspondence last week. While there was a general disposition to prolong the Union to 1921 and to make another effort to organize trade combinations in finished products, the fact was not disguised that the prospects for the fulfillment of the second of these objects were unfavorable.

The downward movement of prices continues. A dispatch from Dortmund says that soft steel bars are being offered in the Rhenish-Westphalian district at 90 to 91 marks ($21.42 to $21.66), net cash. It is added that export offers of 80 to 81 marks ($19.04 to $19.28), f.o.b. Antwerp, have been made by some of the works having special grounds for trying to obtain new orders. The position of iron bars has also depreciated to such an extent that sales are now occurring at 130 marks ($30.94) for ordinary merchant sizes, which is the lowest level touched for several years. The leading manufacturer of screws in western Germany has announced a further reduction of prices by 1 to 3 per cent. and the dealers' organization has made corresponding reductions. The Association of German Street Railway Administrations has renewed its contracts with the Union for rails for several years at reductions of 5 or 6 marks ($1.19 to $1.43) a ton, but on a considerably increased volume of orders.

The Cologne Gazette began several days ago its usual monthly survey of the market in the following terms: "The market presents a picture of complete demoralization. The belief that the low-water mark had already been passed and a recovery would now begin, has not been confirmed. It is now seen more and more clearly that the capacity of the great establishments has been increased far beyond the present consuming requirements of the trade. In spite of this fact the impulse to expand appears to continue among those works, for according to recent reports some of them are occupied with new enlargement plans."

Shipments of pig iron in April dropped to about 78 per cent. of allotments, which compares with 80.15 per cent. for March. The production in April reached 1,534,000 metric tons. It was smaller by 69,000 tons than the March production, and 55,000 tons smaller than for April, 1913. The reduction for the first four months of the year is about 170,000 tons. Business in scrap is dull, and prices have further yielded. As there is a great abundance of material in the market, no improvement in prices can be looked for soon.

The April shipments of rails and structural material were lighter than in March. In rails and ties the mills are still pretty well supplied with orders. Business in rails for mining and other temporary trackage has become somewhat more active, but is still below the level of previous years. In grooved rails there is ample work in hand, and the prospects are regarded as good.

The trade in bars, plates and tubing appears to be growing worse. The greatest depression of the trade is in these specialties. Work is evidently growing scarcer.

Much interest attaches to the meeting of the rod manufacturers that is to be held today, though expectations of an agreement to renew the organization are at a low pitch. The increased allotments demanded by some companies that have either already built rod mills or are planning to do so will apparently make an agreement impossible. It is mentioned, for example, that mills of as great capacity as 60,000 tons a year are projected.

The following company news has come in this week: Thyssen, at Hagendingen, Lorraine, will soon blow in six recently erected blast furnaces. The Aumetz-Friede Company will in a few days begin work with its new blooming mill at Knuettingen, Lorraine, with a capacity of 1500 to 2000 tons a day. The Felten & Guilleaume Company, which had planned the erection of a new steel mill in connection with its blast furnaces at Steinfort, has decided to postpone the project for the present. The great Gelsenkirchen Company has just taken another order from Argentina for over $2,000,000 of piping (apparently cast iron).

Metal Market

NEW YORK, May 20, 1914.

The Week's Prices

Cents Per Pound for Early Delivery

	Copper, New York			—Lead—		—Spelter—	
		Electro-	Tin,	New	St.	New	St.
May	Lake	lytic	New York	York	Louis	York	Louis
13	14.37½	14.12½	33.80	3.90	3.80	5.15	5.00
14	14.37½	14.12½	33.95	3.90	3.80	5.15	5.00
15	14.37½	14.12½	34.45	3.90	3.80	5.15	5.00
16	14.37½	14.12½	.....	3.90	3.80	5.15	5.00
18	14.37½	14.12½	33.20	3.90	3.80	5.15	5.00
19	14.37½	14.12½	33.00	3.90	3.80	5.15	5.00

Copper buying has not been heavy but it is steady at unchanged prices. Tin is lower after a short-lived upward movement. Lead is dull but firm. Spelter is inactive. Antimony is without feature, except that the recent slight advances hold.

New York

Copper.—In the latter part of last week there was talk of good buying on the part of domestic consumers and there have been some assertions to this effect this week, but on the whole there has been no heavy buying for the reason that buyers were skeptical of the reports afloat and did not take hold as they were expected to do. Near the close of last week some sellers tried to advance their price ⅛c. but the move was not successful, as there was enough copper to be had at a lower price to supply the demand. Electrolytic is quoted to-day, as it has been throughout the week, at 14.12½c. cash, New York, and it is possible that this price might be shaded a few points. The busiest con-

sumers at this time are the makers of ammunition, whose activity is due to the Mexican situation. The demand for copper wire and rolled products has not improved much and the base price of hot rolled sheets has been reduced ¼c. per lb., making the new base 19½c. Lake is practically nominal at 14.37½c. to 14.50c., the latter price being paid by those who have imperative need of high grade metal. The London quotations today are £63 7s. 6d. for spot and £64 for futures. The exports this month total 22,578 lb.

Tin.—This metal has had a more interesting week than has been the case in some time, largely due to the happenings in London, where for several days the market had been working up, causing prices here to rise also. On Friday and Saturday, there was pessimism in the trade here and a couple of sellers made offerings at concessions, a fair business resulting at 34.62½c. to 34.75c., according to position. On Monday the London prices toppled and came down heavily, the loss being £6 5s. on that day. Domestic sellers followed. Sales on that day were made at 33.15c., 33.17½c., 33.20c. and 33.25c., between 200 and 250 tons being traded in. Yesterday the market was stagnant. The decline in London was brought about by reports that the May shipments from the Straits would amount to between 6700 and 6900 tons, which, if true, means that records will be broken. On top of these reports came other estimates that the June shipments from the Straits would total at least 6000 tons. Confidence was developing last week and it looked as though good business was to be expected, but Monday's break had a bad effect on sentiment from which recovery will be slow, according to the views of the trade. The New York quotation yesterday was 33c. The London quotations to-day are £148 15s. for spot and £150 10s. for futures. Arrivals this month total 2146 tons and there is afloat 2185 tons.

Lead.—Extreme quiet prevails, but the market is firm at 3.90c., New York, and 3.80c., St. Louis. About the only business done has been some dealings in future deliveries for which premiums were paid, August having been sold at a price equal to 3.87½c., St. Louis. Following a steady advance, London is quoted at £19, which again raises the possibility of exports. The foreign quotation is equal to 4.12½c., which would permit exports at about 3.85c., f.o.b. New York. It is hardly likely, therefore, that the market here will go any lower.

Spelter.—Quotations are unchanged at 5.15c., New York, and 5c., St. Louis. Considering the dullness, concessions might be obtained for prompt delivery. For futures there has been some little increased inquiry, but not much business.

Antimony.—Cookson's is quoted at 7.25c. to 7.35c., but not much business is stirring. Hallett's is unchanged at 6.85c. to 7c. and Chinese and Hungarian grades at 5.75c. to 6.35c.

Old Metals.—Dullness still prevails. Dealers' selling prices are lower as follows:

	Cents per lb.
Copper, heavy and crucible	13.50 to 13.75
Copper, heavy and wire	13.00 to 13.25
Copper, light and bottoms	12.25 to 12.50
Brass, heavy	9.00 to 9.25
Brass, light	7.50 to 7.75
Heavy machine composition	12.00 to 12.25
Clean brass turnings	8.75 to 9.00
Composition turnings	11.00 to 11.25
Lead, heavy	3.65
Lead, tea	3.40
Zinc scrap	4.25

Chicago

MAY 18.—With scarcely enough trading to establish a market, prices have adhered to the basis quoted by producers. Tin, after a showing of returning strength for the greater part of the week, has again slumped with a net loss as compared with our last quotation. Other prices are not quotably different. We quote as follows: Casting copper, 14.25c.; Lake copper, 14.50c. to 14.75c. for prompt shipment; small lots, ¼c. to ⅜c. higher; pig tin, carloads, 33.75c.; small lots, 35.75c.; lead, desilverized, 3.85c., and corroding, 4.10c., for 50-ton lots; in carloads, 2½c. per 100 lb. higher; spelter, 5c. to 5.10c.; Cookson's antimony, 9.50c. for cask lots; other grades, 8c.; sheet zinc, $7, f.o.b. La Salle or Peru, Ill., less 8 per cent. discount in carloads of 600-lb. casks. On old metals we quote buying prices for less than carload lots as follows: Copper wire, crucible shapes, 11.50c.; copper bottoms, 10.25c.; copper clips, 10.75c.; red brass, 10.75c.; yellow brass, 7.50c.; lead pipe, 3.30c.; zinc, 3.50c.; pewter, No. 1, 23c.; tinfoil, 26c.; block tin pipe, 29c.

St. Louis

MAY 18.—The metal market has been slightly stronger the past week and quotations are a little higher than recently, particularly the Missouri products, lead and spelter. Lead is quoted at 3.85c. to 3.90c.; spelter, 5c.; tin, 34.70c. to 34.85c.; Lake copper, 14.70c.; electrolytic copper, 14.60c.; Cookson's antimony, 7.60c. to 7.75c. In the Joplin ore market the basis range for 60 per cent. was $37 to $41 per ton, which was $1 to $1.50 higher than the preceding week, but on the choicest ores the best prices realized were not in excess of $43. Calamine was stronger at $20 to $22, with the choicest grades running to $27. Lead ore was steady at $46. Miscellaneous scrap metals are quoted as follows: Light brass, 6c.; heavy yellow brass, 8c.; heavy red brass and light copper, 10c.; heavy copper and copper wire, 11c.; zinc, 3c.; lead, 3.25c.; tea lead, 3c.; pewter, 23c.; tinfoil, 29c.

Iron and Industrial Stocks

NEW YORK, May 20, 1914.

Under the leadership of Steel Corporation stocks, values of securities have risen sharply. The apparently well-founded rumors that a decision permitting an advance in Eastern freight rates of close to 5 per cent. will be made by the Interstate Commerce Commission before the close of the month and more encouraging reports regarding the iron and steel trades are responsible for the improvement in values. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week has been as follows:

Allis-Chal., com.	10½ - 11⅝	Pressed Stl., com.	42½ - 45¼
Allis-Chal., pref.	41 - 44	Ry. Spring, com.	28¾ - 30¼
Am. Can, com...	26½ - 28⅝	Ry. Spring, pref.	98
Am. Can, pref...	89⅝ - 91¼	Republic, com...	22¾ - 24
Am. Car & Fdy., com.	49⅜ - 51¾	Republic, pref...	85½ - 87½
Am. Car & Fdy., pref.	117¾ - 118	Rumely Co., com.	10 - 11¼
Am. Loco., com..	31⅞ - 33½	Rumely Co., pref.	29
Am. Loco., pref..	98½ - 98⅝	Sloss, com	28
Am. Stl. Fdries..	30⅛ - 31½	Sloss, pref.	86½
Bald. Loco., com.	48	Pipe, com	10
Beth Steel, com..	41 - 43⅛	U. S. Steel, com.	59 - 63¼
Beth. Steel, pref.	85⅛ - 85½	U. S. Steel, pref.	108¾ - 110
Case (J. I.)....	84 - 86¼	Va. I. C. & Coke	45
Colorado Fuel...	27½ - 28	West'g'hse Elec..	74 - 76⅞
Deere & Co., pref.	94¾ - 95	Am. Ship, com	36
General Electric.	147 - 148½	Chic. Pneu. Tool.	53 - 54
Gt. N. Ore Cert.	32¾ - 33½	Cambria Steel...	47 - 48½
Int. Harv., com.	106½ - 108¾	Lake Sup. Corp.	18¾ - 19½
Int. Harv., Corp.	105 - 106⅛	Pa. Steel, pref...	60 - 62
Int. Harv., Corp., pref..	114⅛	Warwick	10¾
Int. Pump, pref.	19	Cruc. Steel, com.	14¾ - 15⅝
Nat. En. & St., com....	11¼	Cruc. Steel, pref.	90¾ - 92
Pitts. Steel, pref.	85	Harb. Wk. Ref., pref..	98½
		La Belle Iron, com....	37¾
		La Belle Iron, pref....	118

Dividends Declared

The Harbison-Walker Refractories Company, regular quarterly, ½ of 1 per cent. on the common stock, payable June 1.

The Moline Plow Company, regular quarterly, 1½ per cent. on the second preferred stock, payable June 1.

The Underwood Typewriter Company, regular quarterly, 1 per cent. on the common stock, and 1¾ per cent. on the preferred stock, both payable July 1.

The Republic Iron & Steel Company, regular quarterly, 1¾ per cent. on the preferred stock, payable July 1.

The Lindenberg Steel Company, Remscheid, Germany (90 West street, New York), controls the rights for practically all Europe of the Heroult electric furnace. By inventing a special acid lining for the furnace this company has further developed the process. Patents for this improvement, known as the Heroult-Lindenberg process, have been taken out in all industrial countries.

SECONDARY METALS IN 1913

Recoveries from Scrap Copper, Lead, Zinc, Tin, Etc., $72,845,000

The value of "secondary metals," metals recovered from waste scrap (exclusive of gold, silver, platinum and iron) in the United States in 1913 was $72,845,000, according to J. P. Dunlop, of the United States Geological Survey. Compared with 1912 this was a decrease of $4,551,000, the total value for that year being $77,396,000. While scrap iron statistics are not gathered, it is stated that the use of magnetic separators to free scrap from iron, the recovery of metal from cinders and molding sand and the use of machines to briquette small scrap in order to reduce losses in melting continued to increase. It is asserted that the use of properly made ingots of suitable composition is more economical and produces better and more uniform products than the use of virgin metals, or mixed scrap and virgin metals in making alloys.

The production of secondary metals in the United States in 1912 and 1913, with the values, is shown in the following table:

Metal	1912 Net tons	1912 Value	1913 Net tons	1913 Value
Secondary copper, including that in alloys other than brass	66,441	$21,593,325	66,980	$20,536,068
Remelted brass	101,523	27,279,516	99,315	24,651,969
Secondary lead	30,266		33,104	
Recovered lead in alloys	36,902	6,045,120	39,730	6,409,392
Secondary spelter	52,251		50,005	
Recovered zinc in alloys other than brass	3,912	7,759,494	3,743	6,019,776
Secondary tin	8,333		6,415	
Recovered tin in alloys	7,068	14,301,368	7,763	12,567,379
Secondary antimony	13		45	
Recovered antimony in alloys	2,493	426,020	2,660	460,932
Secondary aluminum	.....	.....	2,198	
Recovered aluminum in alloys	.....	.....	2,456	2,199,480
Total value	.....	$77,395,843	.....	$72,844,996

The total amount of secondary copper recovered in 1913, on the assumption that the brass remelted had an average copper content of 70 per cent., was 136,500 tons. At least 45,000 tons of this was reclaimed from clean scrap made in the course of the manufacture of copper and brass ware or from material that had actually been used and discarded. The production of copper from secondary sources in 1913 was equal to about 17 per cent. of the refinery output of primary copper in the United States from all sources, or about 22.4 per cent. of the primary copper smelted from domestic ores.

The secondary lead recovered in 1913 amounted to 72,834 tons, or about 5700 tons more than in 1912. It was equal to 15.2 per cent. of the refined lead produced in the United States in 1913 compared with 13.5 per cent. in 1912, or 16.7 per cent. of the refined lead produced from domestic ores in 1913. It was exceeded by the domestic lead output of only two States—Missouri and Idaho—and only one other State, Utah, had an output of lead nearly as large as the secondary lead recoveries.

The output of secondary zinc, including that in brass, amounted to 79,570 tons and equaled 23 per cent. of the total production of primary spelter in the United States, compared with 24.1 per cent. in 1912. In addition to the large quantity of spelter recovered it is estimated that over 15,000 tons of zinc chloride was made from drosses, skimmings, etc., and likewise several thousand tons of zinc pigment.

The production of secondary antimony increased from 2506 tons in 1912 to 2705 tons in 1913. The only antimony of domestic origin smelted in the United States in 1913 was 116 tons from Nevada, which was mined prior to 1912.

No domestic tin ores being smelted in the United States in 1913, secondary tin became an important factor in supplying domestic consumption. The quantity recovered decreased from 15,401 tons in 1912 to 14,178 tons in 1913, which was 27.2 per cent. of the tin, as metal or oxide, imported into the United States during the year—52,141 tons.

For the first time the Survey obtained statements of the quantity of secondary aluminum recovered as pig aluminum or in alloys; and while the inquiry may not have reached all producers the results show that the percentage of secondary aluminum used compared with virgin metal was fully as large as in other non-ferrous metals. The recoveries in 1913 amounted to 4654 tons valued at $2,199,480. Of this total 2456 tons was recovered in alloys over 90 per cent. of which was an alloy of 92 per cent. aluminum and 8 per cent. copper for making sand castings.

Curious Decarburization in Hardening Steel Dies

The following note was contributed to the London meeting of the Iron and Steel Institute, May 7 and 8, by Dr. H. C. Greenwood:

"In some preliminary trials of an electric muffle for hardening steel dies the steel (containing about 1 per cent. of carbon and 1 per cent. of chromium) was allowed to soak at 820 degrees. C. for an unnecessarily long time—namely, about one and a half hours—in order to make quite sure of uniformity of temperature. The working face of the die was protected against scaling by a sheet-iron cover filled with powdered charcoal. On removal from the furnace the cover was knocked off, the face brushed free from charcoal and the block quenched under a spray. Curiously enough the working face, which had been in contact with charcoal during the heating, was found to be superficially soft, while all the other parts of the die (which, by the way, had a less sudden cooling) were perfectly hard. The surface could be filed to a depth of about half a millimeter, below which the steel was glass hard. This behavior was not confined to a single instance, but was observed in all cases where the surface was protected in this way. If the face were left bare the surface was perfectly hard, but somewhat pitted by oxidation. This difficulty was, however, overcome by using some inert powder, such as fine sand, instead of charcoal, to cover the surface, no diminuation of the hardness being effected.

It only remained to seek an explanation of the paradoxical action of the charcoal in softening the surface layer. Some test-slices of the steel were accordingly taken and heated under the same conditions, packed in charcoal, for about one and a half hours, while similar strips, unprotected in any way, were heated alongside. All were quenched together, and, after annealing at 600 degrees, and cleaning with emery, the respective surfaces were planed off (taking a very light cut) and combustions made of the planings. This procedure was repeated, changing round the specimens after machining off 1/8 in. from each surface. The analyses gave the following results:

	First experiment, carbon, per cent.	Second experiment, carbon, per cent.
Specimens protected by charcoal	0.38	0.59
Specimens unprotected by charcoal	1.08	0.87

It is clear from these results that a decarburization of the surfaces in contact with carbon had been effected, and this is confirmed by the fact that the soft skin persists on rehardening. Why such an action should take place is, however, not very obvious, and the main reason for publishing this note is to ascertain if any similar effects have been observed by others.

The report of the council of the Iron and Steel Institute shows a total membership on December 31, 1913, of 2102. There are 64 life members and seven honorary members and one patron.

PERSONAL

H. V. Jamison, advertising manager of the American Sheet & Tin Plate Company, Pittsburgh, has been appointed director of the United States Steel Corporation's exhibits at the Panama-Pacific Exposition, for which elaborate plans have been made as already outlined in these columns.

S. B. Harding has resigned as consulting engineer and director of the Modern Steel Structural Company, Waukesha, Wis.

A. H. Boyd, who has been with the Fort Wayne Electric Works, Fort Wayne, Ind., since 1898, for the last four years being manager of the Philadelphia Office, has resigned to become general manager and treasurer of the Santo Mfg. Company, Philadelphia, which has purchased the patents and manufacturing facilities of the Keller Mfg. Company.

J. J. Ranney has been elected a director of the International Harvester Company of New Jersey and the International Harvester Corporation, succeeding Norman B. Ream.

E. A. Savage, representing Buck & Hickman, Ltd., London, England, addressed the export Club of Cincinnati, Ohio, May 15, on "England as a Market for Cincinnati Goods."

James A. Murphy and S. H. Charles, of Murphy & Charles, Inc., Valparaiso, Chile, visited a number of manufacturing plants in Cincinnati, Ohio, last week.

Otto Abrahamsen, treasurer of Beaudry & Co., Inc., Boston, has gone to Europe. He will be absent about three months.

J. G. Butler, Jr., has been re-elected president of the Chamber of Commerce of Youngstown, Ohio.

M. C. Turpin of the Westinghouse Publicity Department, has been elected president of the Westinghouse Club, composed of about 800 Westinghouse employees.

Stanley H. Smith, formerly associated with the Steelton sales office of the Pennsylvania Steel Company and latterly located at Cleveland, has been transferred to the Chicago office of that company.

Fred. H. Ogden, engineer for the frog and switch department of the Pennsylvania Steel Company at Steelton, has been transferred to the Chicago office to become associated with the sales department.

The Warner & Swasey Company's New York office, which covers eastern New York, eastern Pennsylvania, New Jersey, Delaware, Maryland and Virginia, is now under the management of L. K. Berry, assisted by Eugene Gardner. Mr. Berry has been associated with the Warner & Swasey Company for nearly 10 years as well as having had connections with machinery houses in Philadelphia and Cleveland. H. E. Witham, who had temporary charge of the office following the departure of C. J. Stilwell to represent the company in Europe, has been appointed manager of the Chicago office and show room.

The Texas Iron Association, of which D. M. Barringer, Philadelphia, is president, has notified Governor O. B. Colquitt of Texas that the association will forfeit its contract with the State for the operations of the iron mines and blast furnace at Rusk, Tex. The association took over the property several months ago and has expended, it is stated, more than $100,000 in developing the ore beds and rehabilitating the furnace plant. The reason given by Mr. Barringer is that the excessive freight rates make the manufacture of pig iron at Rusk unprofitable.

The officers of the American Steel & Wire Company started last week on a two weeks' tour of inspection of the company's plants, including the new rod and wire mills at Fairfield, Ala. The Eastern portion of the tour will end with the meeting of the American Iron and Steel Institute in New York.

Amalgamated Association Proceedings

At the annual convention of the Amalgamated Association of Iron and Steel Workers, in session at Columbus, Ohio, last week, all the old officers were re-elected, as follows: John Williams, president; M. F. Tighe, secretary and treasurer, and D. J. Davies, assistant secretary. The plan to hold the national convention every two years instead of every year was defeated. Resolutions were adopted that the national vice-president appoint deputies for each tin house in the jurisdiction, and also that a wage scale be prepared for the tin and sheet mill openers. A wage scale for this class of labor has never before been operative. It seems probable that the present wage scale for puddling and bar finishing mills and sheet and tinplate mills will practically be reaffirmed for the year beginning July 1.

A number of leading bar-iron makers, notably from East Chicago, Ft. Wayne and New Albany, Ind., and Detroit, Mich., with James H. Nutt, secretary of the Western Bar Iron Association, appeared before the convention and made reports as to the depression in the bar-iron trade and gave facts about the low prices ruling for bars. These manufacturers asked that the wage-scale committees take into account the conditions existing and be governed accordingly.

American Iron and Steel Institute Spring Meeting

Acceptances from 450 members of the American Iron Steel Institute, already received, promise a new record in attendance for the spring meeting at the Waldorf-Astoria, New York, Friday, May 22. The Illinois Steel Company has developed its blast-furnace practice to meet conditions in which the plant demands for gas for power purposes exceed temporarily the need of hot metal. Hermann A. Brassert, of that company, will present a paper on "Modern American Blast-Furnace Practice" at the morning session which will bear on this problem. A paper entitled "The Importance of the Investment Factor in Sales Policy," by President Bray, of the Republic Iron & Steel Company, also to be presented Friday morning, recalls Chairman Topping's recent testimony as to that company's method of fixing selling prices. The afternoon session will be devoted to a consideration of "The Practical Importance of Heat Treatments in the Steel Wire Industry," a paper by John F. Tinsley, and papers relating to recent progress and developments in the steam turbine and in by-product coke ovens. The latter papers are, in subject matter, an expansion of previous Institute discussions. At the evening banquet the welfare work which is being fostered by the Institute is to receive its customary attention and impromptu talks may be expected.

Some of the quotations made on plates and other material to be delivered for a supply ship at Boston and for a transport at Philadelphia, according to bids opened May 12, are as follows: Barber & Ross, Washington, D. C., 4748 tons of plates, $123,926.60, and a unit price on alternate bids of $25.80 per ton; Naylor & Co., New York City, for 700 tons of angles, $19,838; J. B. Kendall Company, Washington, D. C., for 788 tons of channels, $24,070.44; Naylor & Co., for 134 tons of steel flat bars, $3797.56; Worth Brothers Company, Coatesville, Pa., for 1025 tons of sketch plates, $28,122.25. The foregoing are merely the minimum quotations on parts of the whole work.

The Gun-crete Company has opened its new offices in the McCormick Building, Chicago. It makes a specialty of cement-gun work for engineering and industrial structures, having at its disposal a large amount of the most modern cement-gun equipment and an efficient working organization. The cement-gun process is especially adapted to steel protection work, water and fire proofing, the lining of reservoirs and tunnels, etc. Carl Weber, who is president of the company, is a widely known concrete engineer. He is the inventor of the reinforced concrete chimney, now in extensive use, and has designed and erected numerous important engineering structures.

Pittsburgh and Nearby Districts

The Cambria Steel Company is rebuilding and enlarging all of its eight blast furnaces at Johnstown, Pa. To avoid shutting down the plant, reconstruction is going forward on two furnaces at a time, and the work will not be completed for some months. Most of the machine shop work is being done by the company, but a large tonnage of castings and miscellaneous material will be purchased.

Furnace A of the Youngstown Sheet & Tube Company, East Youngstown, Ohio, is running on basic iron to be used in the open-hearth plant, while the other three stacks are running on Bessemer iron used in the Bessemer department.

The bi-monthly settlement of the puddling and bar-iron scale was made last week and it was found that the average price on shipments of common iron bars in March and April did not warrant any change in the boiling scale, which will remain at $5.70 per gross ton for May and June. Muck rolling is paid one-eighth of the straight price for boiling.

Conditions among the manufacturing plants in the Youngstown district are less active than for some time, being below the rate of operation at any time since Christmas. Two blast furnaces, No. 2 Hazelton of the Republic Iron & Steel Company and No. 5 at the Ohio works of the Carnegie Steel Company, were blown out May 15. At the Republic mills the Bessemer plant, which has not been operated for some time, is still idle. The open-hearth plant, plate mill and tube mills at the Lansingville plant are on, while four mills at the Brown-Bonnell plant, which were idle last week, resumed Monday. The Ohio works shut down Friday morning, but resumed in part on Monday. It will work again this week on a four-day schedule. The lower Union works will work on a four-day schedule from Tuesday to Saturday morning. The upper Union works went on in full Monday. The average of operations in Youngstown mills is now down to about 60 per cent. of capacity.

The Trussed Concrete Steel Company, Youngstown, will furnish all the reinforced concrete steel construction for the new Y. M. C. A. building now being erected in that city.

Frank H. Buhl, a large stockholder in the Sharon Steel Hoop Company, Sharon, Pa., has disposed of his entire holdings to Severn P. Ker, president of the company. The transaction gave rise to various reports, in regard to which President Ker has made the following official statement: "The company is not selling and has not at any time been selling stock to its customers or to the public. The recent purchase from F. H. Buhl of his holdings in this company by myself was made solely for the benefit of myself and my associates in the company. It does not change in any degree the management of the company or shift the control of its stock. The company has no idea or purpose of making the corporation co-operative."

The Duquesne Light Company, Pittsburgh, will make large additions to equipment at its power station on Brunot's Island. It has just placed a contract with the Westinghouse Electric & Mfg. Company for four 15,300-kw. turbo-generator sets. These with 10,500 kw. now in turbines in the plant that are to be retained will make a total of nearly 75,000 hp. The plant has 30 boilers in its steam equipment and 20 boilers will be added at once. In making these changes the company has abandoned three 5000-kw. turbo-generator sets that have been doing duty for some time, the purpose being to increase the efficiency of the plant with larger power units, at the same time reducing the space required.

The Griffin Mfg. Company, Erie, Pa., will build a two-story boiler house of steel brick and concrete to cost $8000.

Coal briquettes to the amount of 181,859 tons valued at $1,007,327 were manufactured in 1913 in the United States, according to E. W. Parker of the Geological Survey. This is a decrease of 17 per cent. in tonnage compared with 1912, but an increase of 5½ per cent. in value.

National Association of Manufacturers

The nineteenth annual meeting of the National Association of Manufacturers opened Tuesday morning, May 19, at the Waldorf-Astoria, New York, with a good attendance. The first day's session was largely given over to the consideration of industrial betterment, on which manufacturers, educators and industrial experts presented reports or expressed their views. The discussion was started by the president of the association, Col. George Pope, Pope Mfg. Company, Hartford, Conn., whose official address dwelt on the desirability of establishing closer relations between employers and employees. He said, in part:

> If by a new unionized sentiment between ourselves and our associated employees exclusively we could speedily get rid of the reckless, mercenary and malevolent labor leader, with his gospel of distemper and his inflated ideas of phantom power; if also we could clear the decks of political medicine men, with their noisy demagogy and blatant claims; if we could awaken in the minds of the selfish and reversionary type of employer a quickening sense of broad, enlightened responsibilities—if, I say, these retarding elements could be eliminated by force of the united efforts of employers and employees, a new era of industrial order would be attained.
>
> I believe the spirit of calmer outlook is broadcast in our land, and that employees are beginning to critically survey and appraise the alleged claims of their so-called leaders. I would say that labor leadership is decidedly on the defensive in the eyes of their own constituency. The promised land has turned out to be a wilderness. It is, therefore, the employers' time and opportunity to demonstrate beyond all cavil that the best friend, the wisest protector is the American employer. That is the real, the ideal union.

Among those who participated in the discussion of various phases of this question were F. C. Schwedtman, Howell Cheney, C. W. Price, O. H. L. Wernicke, J. A. Robertson, J. B. Douglas, H. E. Miles and Rev. H. R. Miles.

The secretary, George S. Boudinot, read a cablegram, just received from John Kirby, Jr., one of the three commissioners sent by the association to study trade conditions in Australasia, in which Mr. Kirby reported from Sydney that the Australian Postmaster General was anxious to arrange a 2-cent reciprocal postal rate with the United States and advising that American manufacturers send direct representatives to Australasia.

John Trix, president American Injector Company, Detroit, Mich., reporting for the committee on fire prevention, mentioned that Europe had grappled with both the physical and moral problems involved in fire hazards. He stated that the code Napoleon makes the man who burns his house or store by carelessness responsible for any damage that may ensue to his neighbor, and that in Germany a fire is regarded as a crime. In general this policy is followed in nearly all European countries, which accounts somewhat for the fact that their fire losses are about one-tenth of those in the United States.

Fire Commissioner Robert Adamson told of some of the results accomplished by the Fire Prevention Bureau in New York City.

Meeting of Stove Manufacturers

The National Association of Stove Manufacturers held its annual meeting last week in the Hotel Astor, New York. Some time was spent in discussion of the Oldfield bill before Congress, H. R. 11321, respecting the registration of designs of stoves, and it arranged that a delegation of members of the association, numbering 32 in all, appear at a hearing at Washington, on May 18.

Charles F. Mertz, Rochester, N. Y., was elected treasurer, vice the late Frank Mixter, and the rest of the officers were re-elected as follows: President, James A. Lansing, Scranton, Pa.; vice-president, Lewis Moore, Joliet, Ill.; vice-president, John M. Dwyer, Detroit; secretary, Percival W. Elliott, Boston; executive committee: chairman, Frederic W. Gardner, St. Louis; Charles A. DuCharme, Detroit; Joseph W. Emery, Quincy, Ill.; John H. McClure, Nashville, Tenn.; John H. O'Brien, Cleveland; Richard E. Warner, Taunton, Mass.; Russell E. Sard, Albany, N. Y.

Judicial Decisions

ABSTRACTED BY A. L. H. STREET

SUPERIORITY IN QUALITY AS BREACH OF CONTRACT.—When a contract of sale calls for goods of a specified grade, the buyer is entitled to treat a tender of articles of different quality as a breach of the contract, although the quality is better than that called for by the agreement, especially if the goods tendered are not as suited to the buyer's needs as those contracted for. (United States Circuit Court of Appeals, Third Circuit, Gunderson vs. Brey, 210 Federal Reporter 401.)

RESPONSIBILITY FOR INJURY TO FOUNDRY WORKER.—A manufacturer is not shown to have been negligent toward an employee who was injured by the toppling over of a casting, merely because the casting was permitted to stand on end, while another employee attempted to fit a bushing in a hole in the casting. Nor can negligence be based upon the fact that the floor upon which the casting was standing was constructed of sand. (Wisconsin Supreme Court, Adams vs. Bucyrus Company, 143 Northwestern Reporter 1027.)

EMPLOYER'S DUTY CONCERNING APPLIANCES.—An employer is not legally bound to use the best possible appliances known to his trade, to secure the reasonable safety of his workmen; it being sufficient that those adopted be as safe as those usually adopted by ordinarily prudent employers in the same kind of work. (Alabama Supreme Court, Caldwell-Watson Foundry & Machine Company vs. Watson, 62 Southern Reporter 859.)

VALIDITY OF PROMISE TO GIVE PERMANENT EMPLOYMENT.—An agreement by an employer to give an injured workman employment for life, in consideration of his release of all claims on account of injury received by him while at work, was lately held by the Kansas Supreme Court not to be invalid because not reduced to writing, and because there was no expressed understanding as to the nature of employment to be given nor the amount of wages to be paid.

RIGHT TO PATENT ON FOREIGN INVENTION.—Under the laws of the United States, a patent may be obtained on a foreign invention unless it has been previously patented or described in a printed publication. (United States Circuit Court of Appeals, Second Circuit, Westinghouse Machinery Company vs. General Electric Company, 207 Federal Reporter 75.)

VALIDITY OF AGREEMENT EMPLOYING PATENTEE INDEFINITELY.—Agreement by a company, on purchasing patent rights from an inventor, to employ him at a stipulated salary so long as the company shall use the patent rights is valid and enforceable. (Kentucky Court of Appeals, Shaw vs. Hudson Engineering Company, 159 Southwestern Reporter 653.)

SUBSTITUTION OF MECHANISM NOT PATENTABLE INVENTION.—Substitution of one kind of well-known gearing for another in a valve reseating machine does not constitute patentable invention, though better results are thereby achieved. (United States District Court, Southern District of New York, Specialty Machine Company vs. Ashcroft Mfg. Company, 205 Federal Reporter 760.)

ACTIONABLE WRONGS IN COMPETITION.—It is an actionable wrong to misrepresent to one's customers that the product of a competing manufacturer constitutes an infringement of a patent, for the purpose of driving trade away from him. It is, also, actionable to maintain a civil as well as a criminal suit, with malice and without probable cause, such as a suit for claimed infringement of a void patent, prosecuted for the mere purpose of harassing a competitor. (Minnesota Supreme Court, Virtue vs. Creamery Package Mfg. Company, 142 Northwestern Reporter 930.)

AUTHORITY OF SHIPPER'S AGENT.—A person empowered by the owner of goods to ship them has implied authority to bind the latter by agreeing with the carrier that in the event of loss the carrier's liability shall be limited to an agreed valuation less than the actual value of the property. (Massachusetts Supreme Judicial Court, Johnson vs. New York, New Haven & Hartford Railroad Company, 104 Northeastern Reporter 445.)

WAIVER OF BREACH OF WARRANTY BY BUYER.—A buyer of a machine cannot defeat liability for the price on the ground of breach of warranty of the machine, if the contract of sale contained a provision to the effect that retention of the machine for 30 days should constitute a final acceptance, and if he failed to reject it within that time. (Alabama Supreme Court, Berlin Machine Works vs. Ewart Lumber Company, 63 Southern Reporter 567.)

TELEGRAPH COMPANY'S LIABILITY FOR DELAYED MESSAGE.—One who is compelled to pay a higher price for goods on account of a telegraph company's negligent delay in delivering a telegraphic order is entitled to recover the amount of the difference in the cost of the goods to him, and if the telegraph company was apprised by the message that the goods were ordered for resale under agreement already made with a third person, the amount of profits lost under the resale contract in consequence of the telegraph company's negligence may be considered in awarding damages against that company, but such profits must be susceptible of definite computation with reasonable certainty. (Kansas City Court of Appeals, Kerns & Lorton vs. Western Union Telegraph Company, 160 Southwestern Reporter 556.)

TRADE FIXTURE AS PART OF BUILDING.—A trade fixture permanently attached to a building by a tenant, such as a ventilator, becomes a part of the building, which the landlord can claim as against the seller's right to reclaim the fixture under a conditional sale contract with the tenant. (Massachusetts Supreme Judicial Court, Natural Autoforce Ventilator Company vs. Winslow, 102 Northeastern Reporter 705.)

WAREHOUSEMAN'S RESPONSIBILITY FOR FAILURE TO INSURE GOODS.—A warehouseman is liable for loss to the owner of goods stored with him, resulting from the former's failure to insure the goods, if the contract for storage or a prevailing custom, in view of which the parties may fairly be presumed to have contracted, required the warehouseman to effect insurance. (Georgia Supreme Court, Farmers' Ginnery & Mfg. Company vs. Thrasher, 79 Southeastern Reporter 474.)

SELLER'S REMEDIES ON BUYER'S BREACH.—When articles are sold for future delivery, and before the time for delivery arrives the buyer gives notice to the seller that he will not receive nor pay for the articles, the seller is entitled to regard the agreement as rescinded and claim from the buyer whatever damages he has sustained up to the time of the repudiation of the contract. If the articles are to be specially manufactured by the seller, and, upon the repudiation of the contract by the buyer, the seller elects not to proceed with the manufacture, his only remedy is to sue for breach of the contract. Before suit of this kind will lie, the seller must have put himself in a position where he could deliver and has either actually delivered the goods or has stored them for the purchaser. (Georgia Court of Appeals, American Mfg. Company vs. Champion Mfg. Company, 79 Southeastern Reporter 484.)

WAIVER OF DAMAGES CAUSED BY DELAY IN DELIVERY.—Agreement by a seller of machinery to extend the time for payment of the price is sufficient consideration to sustain a waiver by the buyer of any claim on account of the seller's delay in delivering the machinery. (New York Supreme Court, Appellate Division, Fourth Department, Rice, Barton & Fales Machine & Iron Company vs. Hoffman-Youmans Paper Mills, 143 New York Supplement 249.)

WHEN SMOKE CONSTITUTES ACTIONABLE NUISANCE.—The owner of a manufacturing plant is liable for damages to nearby property, including depreciation in rental value, resulting from smoke and fumes escaping from the plant in such quantities and manner as to constitute a nuisance. (Washington Supreme Court, Lavener vs. Independent Light & Water Company, 133 Pacific Reporter 592.)

OXIDE OF MANGANESE IN STEEL

Its Rôle in Open-Hearth Operations—Liquid Additions of Ferromanganese Best.

Professor W. Heike, of the famous mining academy in Freiberg, Saxony, has a paper in a recent issue of Stahl und Eisen on the rôle of oxide of manganese, MnO, in steel making practice. It gives his theories regarding the part played by this oxide. In ordinary open-hearth practice the carbon is not all removed from the bath of metal because for most purposes it is not necessary, and because experience has shown that much time is required and the bath must be highly oxidized. The reaction shown below becomes extremely feeble, probably due to the extreme dilution of the carbide greatly reducing its dissociation pressure:

$$Fe_3C + FeO = 4Fe + CO$$

If to such a bath manganese is added in any form there is a more or less lively evolution of carbon-monoxide, CO. Up to now this has been considered due to the carbon in the manganese alloy, but the carbon added in this way is comparatively small, and the author seriously questions the correctness of such a theory. He believes that the action of the oxide of manganese that is formed explains this evolution of gas and proceeds to give his ideas regarding the behavior of the oxide, MnO, which is formed according to the equation

$$FeO + Mn = MnO + Fe$$

This MnO he considers is itself soluble in the bath to some extent, but in practically every case there is an excess that separates and enters the slag. The amount that can remain in solution depends greatly on the temperature of the bath, and the lower the temperature the smaller the amount retained. The oxide formed is undoubtedly liquid at the temperatures used, and it is believed that it has a solvent power for ferrous oxide, sulphides, etc. —in other words, it helps to slag off these other materials, the amounts removed depending on their solubility. Due to this solubility the concentration of the ferrous oxide is changed, its dissociation pressure is increased, and there is once more vigorous action between the Fe_3C and FeO, according to the equation previously given.

The next point taken up is that the manganous oxide, MnO, formed does not separate from the metal as such alone, but undoubtedly carries ferrous oxide, FeO, with it, due to its solvent power for this oxide. In regard to this, if manganese ore is added to the slag to prevent red shortness in the metal, the reason for its beneficial action may be that the solubility of the slag for ferrous oxide is increased, due to which more ferrous oxide comes from the metal to the slag. Such an action of the oxide of manganese has great practical importance, because with the removal or slagging off of ferrous oxide by this oxide a corresponding saving of manganese is brought about. Good results can only be expected, however, if the ferromanganese is previously melted and added liquid. If solid ferromanganese is used it must first be dissolved, and there is produced strong local enrichment of manganese, whereby all the ferrous oxide at these centers is reduced, and oxide of manganese free from ferrous oxide separates from the bath. On the other hand, if the manganese is distributed quickly and uniformly through the bath, as is the case when fluid additions are made, no complete decomposition of ferrous oxide takes place anywhere and all the oxide of manganese that separates carries with it ferrous oxide.

The author then proposes methods to utilize this principle and effect a saving in the manganese additions. The first is to add the ferromanganese intermittently adding enough manganese each time, so to as to produce enough insoluble oxide of manganese, MnO. The second is to remove a great deal, if not all of the ferrous oxide by adding material containing the manganous oxide, or that which is rich in manganese. Any necessary later work can be done by means of final additions in the usual way, but much less should be required. Proper mixing could be brought about by briquetting the manganese-holding material with steel as free from oxide as possible, which briquettes will then readily sink through the slag and enter the bath. An important factor will be that should higher oxides of manganese be introduced or formed negative results would ensue, for further oxidation of the metal would take place.

G. B. W.

Hadfield Prize for Research on Carbon

Sir Robert Hadfield, Sheffield, England, an honorary member of the American Institute of Mining Engineers, has offered the Hadfield Research Prize of $1000 for the best contribution to the publications of the Institute on "The Different Forms and Combinations of Carbon with Iron Including those in Iron Alloys." The prize will be awarded at the annual meeting of the Institute, held in New York in February, 1916, to the best paper on this subject which is presented to the Institute before November 1, 1915, provided such paper is deemed worthy by the Iron and Steel Committee of the Institute. The scope and object of the proposed research are outlined as follows by Secretary Bradley Stoughton in the Institute Bulletin for May:

To elaborate and find out the best methods of determining the forms of carbon in steel or iron, including those in iron alloys. A portion of the work would probably be a continuation of the researches which have in the past been carried out by Jullien, Abel, Muller, Ledebur, T. Sterry Hunt, Akerman, Arnold, Stead, E. D. Campbell, Hogg, Parry, Upton, and others.

In a generic way, metallurgists now speak of carbides, sub-carbides, double carbides, special carbides, and other combinations. It is very desirable that these should be accurately defined and understood. It is also desirable to know whether there are other or new forms; if so, can these be separated and their characteristics obtained.

It may be interesting to point out that the carbon compounds now definitely known are stated to number over 80,000. It is very probable, therefore, that there is room for much valuable and useful research to be carried out with the object of increasing our knowledge of the various combinations of carbon with iron, as probably some of these are still unknown.

In addition to research work upon particular forms of carbide which have not yet been determined, it is also desirable and necessary to determine the state in which the carbon exists. For example, there exists what is termed a "missing form" of carbon, about which little is known or understood. More light is required about this form, as for many years very little has been added to our knowledge on this subject. It would be desirable, for example, to know whether the carbon not accounted for as carbide is "missed" in consequence of its being in so fine a state of division, or whether it is present in some special form or condition.

It may be mentioned as a general statement that when steel is in the austenitic condition it is softer than when transformed to the martensitic formation. In the former, the carbon is considered to be in complete solution; yet steel showing martensitic structure is said to contain its carbon in complete solution also. If it could be shown that the martensitic formation results from the commencement of the falling out of solution of the carbon, this would be of great assistance to all those who are desirous to have increased knowledge in this direction. It is therefore desirable to know exactly in what state the carbon exists in the austenitic and martensitic formations.

It is also necessary, if possible, to ascertain the molecular constitution of the carbides. Such a point has been raised by the able American scientist Prof. E. D. Campbell, and much important research work has been carried out by him with regard to certain particular combinations or forms of carbide. In other words, is the ordinary carbide Fe_3C, Fe_5C_2, or is it some other combination? If so, what is its nature and molecular constitution?

The Machinery Markets

The reports from the most important machinery centers are not good, nor are they at all what they should be at this season. What improvement exists in buying is spotty and confined to a few lines. At the same time sentiment here and there is better. New York is dull, both as to sales and inquiries, but the attitude of sellers is hopeful and they expect a change soon. In New England there has been a slight improvement, which, while not general, has made the average better. Business is light in Detroit, but an encouraging symptom is the number of new concerns incorporating to manufacture. Cleveland conditions as a whole are at low ebb, though hydroelectric and mining machinery are fairly active. Scattered orders were the chief feature in Cincinnati and the good crop reports are bettering sentiment, but conditions generally are unimproved and rebuilt machines are selling better than new equipment. In Chicago the recent improvement proved to be but temporary and the market again is flat. In Milwaukee there is a slightly better feeling in the machine tool trade and in other metal working lines purchasing is picking up. Buying is minimized in St. Louis, but the maturing of staple crops is expected to bring a revival of demand. Mine opening in the Birmingham district has led to some equipment sales, but the market is dull except for the agricultural equipment demand. In the Central South the trade is lagging. The demand in Texas appears to be good for irrigating machinery alone. In the Pacific northwest there is little to feature, aside from the fact that mining equipment has been selling well and the call for pumps to be used in irrigation projects is rather good.

New York

NEW YORK, May 20, 1914.

This market is dull, yet the trade is not gloomy because of a general feeling that better conditions will come along before the expiration of another month. The optimism is not based so much on indications within the trade itself, as on more or less extraneous facts and circumstances, such for instance as the certainty that the railroad freight decision is nearer and that business will improve even if the railroads are not gratified with the complete relief they seek, while if they get the full advance they will be extremely heavy buyers. Their stocks of every kind are depleted and their purchasing agents have lists of many requirements which they would like to see authorized. But whether or not the increase in freight rates is granted the railroads must come into the market before long. Naturally they are loath to buy until the future looks clearer to them. Another influence which has made the future look brighter is the prospect of big crops, though with the machinery trade this is not so immediate a factor as the railroad rate question. Meanwhile both sales and inquiries are fewer and of less importance than they were a week ago.

The Cloverleaf Milling Company, Buffalo, of which M. Frazer is manager, is taking bids for a feed mill and elevator which it will erect at an estimated cost of $250,000.

Francis G. Ward, commissioner of public works, Municipal Building, Buffalo, is this week receiving bids for one 60-hp. water front portable boiler, mounted on wheels, and one marine gasoline engine and equipment for a city launch.

The Jacob Dold Packing Company, William street and New York Central Railroad, Buffalo, will build a two-story steel and brick addition to its engine room.

The I. L. Lewis Mfg. Company, Syracuse, N. Y., has been incorporated with a capital stock of $50,000, to manufacture sanitary sink mops and kitchen equipment. I. L. Lewis, Syracuse, and V. S. & W. E. Lounsbury, Oneida, N. Y., are the incorporators.

The Sterilized Grain Company, Brewster, N. Y., will build a three-story and basement factory, 30 x 120 ft. Robert Stock, 39 Villa avenue, North Pelham, N. Y., is president.

The Brockport Cold Storage Company, Brockport, N. Y., of which Charles Williams is president, is taking bids for construction of a cold storage building 180 x 200 ft., two stories and basement, of stone with slag roof construction.

The Christian Klinck Packing Company, Buffalo, will build an addition to its boiler house, for which considerable new equipment will be required.

The Ashley Wire Wheel & Rim Company, Inc., White Plains, N. Y., has been incorporated with a capitalization of $50,000 to manufacture wire wheels and rims for automobiles, etc. R. W. Ashley, New York City; F. W. Kolb, Brooklyn, and C. Gaschott, Corona, are the incorporators.

The Lisk Mfg. Company, Canandaigua, N. Y., of which C. C. Keehn is general manager, is taking bids for a one-story concrete addition, 60 x 200 ft., which it will make to its plant for the manufacture of stamped and enameled ware.

C. F. Schupp & Son, Albany, have awarded the contract for the erection of a bakery and refrigerator building, 88½ x 110 ft., three stories and basement, to cost $30,000.

The village board of trustees, Arkport, N. Y., will receive bids until June 4 for the construction of a system of waterworks from plans of Charles C. Hopkins, Cutler Building, Rochester, N. Y., the engineer.

O'Neil & O'Neil, Newark, N. J., will soon award the contract for the erection of a two-story factory on Union street.

The Koehl Paper Box Company, Jamestown, N. Y., of which William Koehl is president, will build a factory 80 x 160 ft., three stories and basement. Plans are in preparation.

G. Levor & Co., 88 Gold street, New York City, will erect a leather factory, 60 x 245 ft., three stories and basement, at Gloversville, N. Y., at an estimated cost of $100,000.

B. C. Little, superintendent of waterworks, Rochester, N. Y., is considering the installation of an additional pump for the waterworks, to cost between $3000 and $4000.

The board of trustees of the village of Holley, N. Y., will receive bids until May 22 for constructing a sewage disposal works, etc.

The city of Chatham, N. J., has sold $35,000 of water and light bonds.

The citizens of Milltown, N. J., have voted to install a sewer and water system, in accordance with plans of the Milltown Sewer and Water Commission.

New England

BOSTON, MASS., May 19, 1914.

The general belief in machine-tool circles is that the increased revenue for the railroads to be expected from an advance in rates, now regarded as certain to be granted, means the placing of orders on a large scale for machinery as well as other supplies.

A slight improvement is noted, but the demand is spotty—improvement here, a slacking up there, and then turn about. But the average is better.

The Barnes & Kobert Mfg. Company, New Haven, Conn., manufacturer of telephone and telegraph hardware, will move its business to Milldale, in Southington, Conn., where it will occupy a building recently vacated by the Clark Bros. Bolt Company, which is making extensive additions to its works.

Projected additions to general manufacturing facilities in New England include the following: Cordis Mills, Millbury, Mass., additional building, 82 x 290 ft., three stories, mill construction; Pawtucket Box Corporation, Pawtucket, R. I., brick factory, to cost $15,000; W. W. Windle Company, Millbury, Mass., addition to textile mill; Ernest Gilman, Haverhill, Mass., 4-story brick factory; Thompson & Morris Company, Brighton, Mass., paper boxes, addition to factory, to cost $125,000; Courtney Bobbin Company, Chicopee, Mass., addition to factory; Oxford Paper Company, Rumford Falls, Me., addition to mill; Rattan Mfg. Company, New Haven, Conn., brick factory.

The city of East Norwalk, Conn., has voted $20,000 for the installation of an electric generating plant.

The town of Lunenburg, Mass., has voted $10,000 of bonds for a municipal electric system.

Philadelphia

PHILADELPHIA, PA., May 18, 1914.

The Jewish Foster Home, Church lane below Chew street, Philadelphia, has awarded the contract for the B. F. Teller and Benedict Gimbel memorial building. The plans include the establishment of a manual training department. Sauer & Hahn, 1112 Chestnut street, Philadelphia, are the architects. The same architects are preparing plans for a five-story reinforced concrete factory, 50 x 208 ft., for the J. Sullivan Mfg. Company, Nineteenth street and Susquehanna avenue.

The Keystone Emery Mills, Frankford Station, Philadelphia, Pa., will build a two-story factory, 25 x 97 ft., to take care of increased demand.

The Lehigh & Wilkes-Barre Coal Company, Wilkes-Barre, Pa., will erect one and two-story brick and concrete shops which will include a machine shop, blacksmith shop, boiler and structural shop, car shop, wheelwright and carpenter shop, etc. The work will be done gradually and will cover a period of probably two years. The estimated cost is about $150,000. Sturdevant & Poggi, Coal Exchange Building, Wilkes-Barre, Pa., are the architects. C. F. Huber is general manager.

The R. S. Newbold & Son Company, Norristown, Pa., founder and machinist, will add to its present lines the manufacture of gas holders and gas making machinery. A. R. Cruse will be in charge.

The Aldrich Pump Company, Allentown, Pa., has been incorporated by H. M. Howe and F. P. Howe, Philadelphia, Pa., and Horace Hudders and R. H. Aldrich, Allentown, Pa., to take over the electric pump business of the Allentown Rolling Mill Company, Allentown, Pa. The foundry will be enlarged and additional equipment will be required for both it and the machine shop. Executive offices will be maintained at 252 Drexel Building, Philadelphia, Pa.

The city of Allentown, Pa., has voted $39,500 of bonds for the installation of a municipal water plant.

The town of South Allentown, Pa., will borrow $40,000 to cover the cost of a municipal water plant, which has been authorized.

The Kane Glass Company, Kane, Pa., has been incorporated with a capital stock of $150,000 by W. S. Calderwood, W. H. Davis and A. H. Gaffney, and will take over the business of the Kane Window Glass Company.

The Dorner-Tretbar Company, 1210 Kaighn's avenue, Camden, N. J., is building a two-story factory, 41 x 101 ft., and is in the market for electric motors and woodworking machinery.

The Southern Metal & Foundry Corporation, Norfolk, Va., manufacturer of castings, babbitt metal, etc., has been incorporated with a capital stock of $100,000. It has purchased the plant of the Truckers & Mfg. Supply Company, comprising four buildings, each about 40 x 100 ft. The plant will be equipped throughout with modern machinery for smelting and refining brass foundry residue, and for the manufacture of journal and engine brasses, babbitt metal, ingot brass and phosphor bronze. F. D. Miller, Westminster, Md., and associates of the Westminster Metal & Foundry Company, are the incorporators. Operations will start in about three months.

Chicago

CHICAGO, ILL., May 18, 1914.

The renewal of interest in machinery purchases which led to the encouragement of some of the local dealers has proved decidedly temporary. The Commonwealth Edison Company filled its requirements, but by the time the orders were finally placed they proved not especially attractive to any one. In other respects the market has again fallen flat.

The Lucas Signal & Control Company, Chicago, has been incorporated with a capital of $10,000 to manufacture electrical appliances by Paul Pierce, LaGrange, Ill., E. N. Murphy and J. N. Pierce.

The Metal Block Wainscot Company, Chicago, has been organized with a capital of $50,000 to manufacture metal working and fabricating machinery in the office of Stephen A. Day, attorney, 39 South La Salle street.

The engineering committee of the Chicago Sanitary District, Chicago, has voted to advertise for bids for synchronous condensers.

The American Building Foundry Company, Chicago, has acquired a site at Twenty-second street and the Burlington tracks, on which a one-story foundry is to be erected at once. The company is now located at Nineteenth and Rockwell streets.

The Mechanical Improvement Company, Chicago, has been incorporated with a capital of $2500 to engage in manufacturing mechanical appliances by Clemens Fortmann, 5527 Glenwood avenue.

The Erickson Machinery Company, Chicago, has been incorporated with a capital of $5000 by Emil Erickson, 628 East Seventy-first street.

The Pyle Pattern Works, Muskegon, Mich., is building an addition to its foundry, 50 x 150 ft., which will include a molding floor, cleaning and core room.

The Thief River Iron Works, Thief River Falls, Minn., has acquired the Northwestern Drainage Company's machine shops and will erect a new foundry. R. J. McGinn is president.

The Beloit Nickel Plating & Mfg. Company, Beloit, Wis., has purchased an old plant in that city and is installing equipment for doing general machinist and plating work.

The Bogardus Company, Chicago, manufacturer of pressure gauges, has secured a factory site at Marshalltown, Iowa, and will begin the erection of a plant there within 60 days.

The Mechanics Machine Company, Rockford, Ill., has increased its capital stock from $250,000 to $500,000.

The City Council, Veblem, S. D., will spend $16,000 for a waterworks system.

The board of public works, Blue Earth, Minn., has been authorized to spend $2000 for the installation of an electric pumping service at the power plant.

Milwaukee

MILWAUKEE, WIS., May 18, 1914.

A slightly better feeling prevails in the tool trade, due to improved inquiries which indicate that some fair business will develop shortly. None of this prospective business is voluminous, but, considering present orders, may be termed good. In other lines of the metal trades reports are that purchases are picking up but not in sufficient volume to make conditions encouraging. Industrial extensions throughout the State must develop some business soon, and a number of Milwaukee metal-working plants are doing considerable new construction which will require additional equipment.

Articles of incorporation have been filed in behalf of the Solid Brass Works, Milwaukee. The capital stock is $10,000 and the incorporators are E. J. Nickey, W. J. Morgan and B. F. Saltzstein, all of Milwaukee. Plans are as yet indefinite.

The Beijer Hydraulic Transmission Company, Stevens Point, Wis., organized several months ago, to manufacture a new type of gearless transmission system for automobiles and similar motor vehicles, is making arrangements for factory quarters. C. S. Orthmann is manager.

Otto Beifeld & Co., Watertown, Wis., have awarded contracts for the erection of a steel and brick shop, 60 x 104 ft., 36 ft. high, at O'Connell and North Water streets. Purchases of boiler and machine shop equipment are now being made. A. C. Clas, Milwaukee, Wis., is the architect.

The Marvel Motor Works, Kewaunee, Wis., has been purchased by John Klemish & Son from Dishmaker Brothers. The new owners will continue the manufacture of electric motors and general electrical equipment and operate a large repair department.

The A. F. Klinzing Mfg. Company, Fond du Lac, Wis., manufacturer of litter and feed carrier systems, barn equipment, etc., is about to move its plant to New Holstein, Wis. A new factory is being erected and equipment is being purchased.

The Aluminum Goods Mfg. Company, Manitowoc, Wis., will construct a factory addition to the present plant. Preliminary plans have been completed and it is expected that bids will be asked for within a month's time.

J. C. Haberman, Prairie du Sac, Wis., is erecting a frame and sheet metal building, 30 x 36 ft., to be used by him as an automobile repair shop.

The Badger Canning Company, Beaver Dam Junction, Wis., will install additional power equipment.

The Eagle Garage & Machine Company, Platteville, Wis., is building a garage and shop, 50 x 100 ft., two stories and basement, and will require a small list of power and manual tools.

The Reedsburg Motor Truck Company, Reedsburg, Wis., has been organized to engage in the manufacture of commercial vehicles formerly produced by the Piggins Motor Truck Company, Racine, Wis. E. N. McNab, Racine; E. E. Montgomery, Edward Thom and J. Seamans, of Reedsburg, are associated in the work. A machine shop will be established at once in leased quarters and equipment is now being purchased.

The Milwaukee Steel Products Company, Milwaukee, capitalized at $25,000, has been organized to establish a plant for the manufacture of steel and iron products, notably automobile parts. The promoters are A. R. Marggraff, E. M. Dougherty and Nicholas Kies.

The Wausau Sulphate Fiber Company, Wausau, Wis., has increased its capital from $700,000 to $1,000,000 to cover new construction and equipment.

Stubbe & Stulter, Fall Creek, Wis., have broken ground for a two-story machine shop and garage.

The Medford Veneer Company, Medford, Wis., has increased its capital stock from $50,000 to $100,000 and will double the size of its plant. A considerable list of wood-working machinery will be purchased at once. Otto Greiser is president.

The city of Sheboygan, Wis., is taking the preliminary steps for the construction of a new high school building, with manual training department, to cost between $100,000 and $135,000. H. F. Leverenz is city superintendent.

The Key Calk Horseshoe Mfg. Company, Green Bay, Wis., has increased its capital stock from $60,000 to $75,000 to provide for extensions of the business.

The city of Janesville, Wis., has voted to purchase the plant of the Janesville Waterworks Company. It is planned to spend from $50,000 to $75,000 in extending mains and enlarging the pumping facilities. The sale will probably not be effective until after August 1.

Detroit

DETROIT, MICH., May 18, 1914.

Business is no better. Sales are light and of no individual importance and inquiries are not numerous. The automobile industry is doing no buying to speak of and with this factor out of the market the volume of business in the city is not great. One encouraging sign is noted in that the incorporation of new manufacturing companies shows an increase lately and this is taken by many to indicate that capital is becoming less cautious and that general manufacturing conditions will improve. Second hand machinery is dull. No projects of interest to the trade are reported in building circles.

The plant of the Mexican Crude Rubber Company, Detroit, was totally destroyed by fire May 15. Officials state that while the loss cannot be accurately estimated the plant was fully insured and will probably be rebuilt.

The Masco Mfg. Company, Detroit, has been incorporated with $20,000 capital stock to manufacture automobile steering gears. John F. McLaughlin, Grant S. Carroll and James H. Ulrich are among those interested in the new company.

The Retlaw Mfg. Company, Detroit, has been incorporated by Philip N. Mainguy, John W. Anderson and Clarence E. Wilcox with a capital stock of $20,000. The new company will engage in the manufacture of gauges and other specialties.

The Fabricating Steel Company, Grand Rapids, Mich., recently organized, has acquired a factory site of seven acres and is having plans drawn for the first unit of its plant. The building will be 60 x 100 ft., one story. Frank J. Pickett is the active head of the new company.

The Anchor Salt Company, Ludington, Mich., is enlarging its plant.

The Booth Mfg. Company, Howard City, Mich., will add several improvements to its plant this summer, including the installation of a new engine and a sprinkler system.

The Zagelmeyer Machinery Company, Bay City, Mich., manufacturer of cement block machinery, has acquired a factory site of three acres in Windsor, across the river from Detroit, and is having plans drawn for the erection of a branch plant to cost $5000.

It is announced from Ionia, Mich., that J. Hale & Son will erect a grist mill at that point to cost $40,000 and to have a daily capacity of 250 bbl.

The Union Steel Screen Company, Albion, Mich., has begun the erection of extensions to its plant, preparatory to adding the manufacture of windmills to its line. The machine shop will also be enlarged.

The Powers & Walker Casket Company, Grand Rapids, Mich., has taken out a permit for the erection of a three-story addition to its plant, to cost $16,000. An additional story will also be added to its present factory.

The city of Cadillac, Mich., is advertising for bids on the new municipal sewage disposal plant, a bond issue to provide for which was recently carried.

The Kalamazoo Glass Company, Kalamazoo, Mich., has been incorporated to operate a factory for the manufacture of mirrors and other glass products. The Kalamazoo Commercial Club may be addressed.

The Raymond Log Loader Company, Escanaba, Mich., manufacturer of logging tools, is enlarging its plant.

The city clerk, Cadillac, Mich., will receive bids until May 28 for constructing a sewage disposal plant.

Bids are being received by B. A. Faunce, city clerk, Lansing, Mich., for constructing lighting equipment system, according to the specifications of the public lighting committee.

Indianapolis

INDIANAPOLIS, IND., May 18, 1914.

The Federal Foundry Company, Indianapolis, has been incorporated with $200,000 capital stock. The directors are James I. Dissette, formerly with the Indianapolis Foundry Company; B. W. Buck, and E. R. Lewis. The company has bought 23 acres upon which the plant will be built. It is understood that the officers of a large foundry company having plants at Chicago, Cleveland and St. Louis are behind the Indianapolis enterprise.

The Power Car Company, Indianapolis, has been incorporated with $15,000 capital stock to manufacture motor cars. The directors are F. M. Fauvre, E. H. Darrach and P. H. White.

The Brant Brothers-Chapman Company, Indianapolis, has been incorporated with $15,000 capital stock to manufacture automobile accessories. The directors are J. R. Brant, W. F. Brant, and G. W. Chapman.

The Amplex Mfg. Company, Mishawaka, Ind., has

been incorporated with $200,000 capital stock to manufacture metal and wood articles. The directors are H. M. Pulsifer, E. J. Gulick and R. W. Randall.

The Plymouth Mfg. Company, Plymouth, Ind., has been incorporated with $50,000 capital stock to manufacture wood products. The directors are George H. Thayer, Jr., J. W. Thayer and A. G. Wetmore.

The Crow Motor Car Company, Elkhart, Ind., has increased its capital stock $50,000.

The Terre Haute Waterworks, Terre Haute, Ind., has issued $70,500 of common stock, the proceeds of the sale of which will pay for new construction work.

Cleveland

CLEVELAND, OHIO, May 18, 1914.

Conditions in the machine tool market are unchanged. Business is at a low ebb and few orders are being placed except for single tools. The foreign demand is not active. Most lines of general machinery are also quiet. There is a fair volume of inquiry from the East and South for water wheels, these in most cases being wanted for hydroelectric plants to furnish power for paper mills. There is also a fair demand from the West for mining machinery. Steel plants are buying very little equipment. Cranes are not active, inquiries being almost entirely for single installations. Conditions in the foundry trade show no change.

Arthur G. McKee, engineer, Cleveland, Ohio, has been given a contract by the Northern Ohio Traction & Light Company for the erection of an ash storage and handling plant in connection with the company's power house at Cuyahoga Falls, Ohio. The plant will include a 120-ton ash bin, a double skip hoist and an electric locomotive for haulage. Coal weighing equipment will also be installed.

The Hertner Electric & Mfg. Company, 430 Prospect avenue, Cleveland, which has been engaged in the electrical supply business, will shortly begin the manufacture of electrical motors up to 7½ hp. in direct current and 30 hp. in alternating current. Moving picture apparatus will also be made. The company is buying some machinery equipment and later will probably erect a new plant.

The city of Cleveland will receive bids May 29 for an electric freight elevator for the city hospital and for a storage battery set for operating the electric switch and signals at a substation for the municipal electric light plant.

The Specialty Forging Company, Cleveland, has been incorporated with a capital stock of $30,000 by James O. Bennett, John Quinn, and others.

The Coleman Foundry Equipment Company, Cleveland, has been incorporated with a capital stock of $10,000 to manufacture and deal in foundry equipment. F. A. Coleman is president. Its factory will be located at 2102 Abbey avenue.

The Acme Fence & Iron Company, Cleveland, has been formed with a capital stock of $10,000 by L. C. Heimberger and others to manufacture fence.

The Hydraulic Pressed Steel Company, Cleveland, states that the report which has been published that it will build a two-story addition for the manufacture of steel barrels is at least premature. It has this extension under consideration, but does not expect to decide definitely for a number of weeks.

The Union Metal Mfg. Company, Canton, Ohio, maker of ornamental columns and other metal products, will enlarge its plant by the erection of a new building, 70 x 250 ft., which will double its present capacity. It will be two stories for 100 ft. and the remainder will be one story. Charles Eshleman, general sales manager of the Adams-Bagnall Electric Company, Cleveland, will become vice-president and general sales manager on June 15.

The city of Canal Dover, Ohio, will erect a sewage disposal plant at an estimated cost of about $65,000. Plans have been prepared by R. W. Pratt, Cleveland.

The Massillon Aluminum Company, Massillon, Ohio, has placed a contract for the erection of a three-story and basement plant, 42 x 240 ft.

The Silica Milling Company will establish a new plant at Silica, Ohio, near Toledo, for pulverizing silica for use in the manufacture of pottery and for other purposes. A building 100 x 200 ft. will be erected.

An ordinance has been passed for a waterworks for the city of Lowellville, Ohio.

C. J. Pim, city clerk, Canton, Ohio, will receive bids until May 26 for constructing a sewage treatment plant.

Cincinnati

CINCINNATI, OHIO, May 18, 1914.

The excellent crop reports from different parts of the country have exerted a potential influence toward creating a better feeling in all manufacturing lines. While this reason cannot be claimed to be responsible for any improvement in the machine tool business, it is a fact that several local plants received scattering orders last week that were very welcome and encouraging at this particular time. Neither the railroads nor the automobile manufacturers are buying any machine tools, except for replacement purposes, and such orders from those sources are now few and far apart. Conditions are unchanged with the dealers, with rebuilt machines in better demand than new ones. Wood-working equipment is dull, and the call for it is principally from the South. The export business in all kinds of machinery shows little improvement, although this is the season when it should be at its best. The jobbing foundries are a trifle more busy than reports indicated the previous week.

The proposed plant of the Ford Motor Car Company, to be located on Lincoln avenue, Cincinnati, will be 167 x 263 ft., four stories, of reinforced concrete construction. The Irwin-Leighton Company, Philadelphia, Pa., will construct the factory.

The Perkins-Campbell Company, Cincinnati, will add equipment to its saddlery and harness plant on Sycamore street.

The Cincinnati Mfg. Company, Cincinnati, has acquired more ground adjoining its brass specialty manufacturing plant, and it is rumored that an addition will be made at an early date.

The Ahrens-Fox Fire Engine Company, Cincinnati, has plans under way for an immense addition to its plant in West End. No details are yet available.

The Early & Daniels Company, Cincinnati, will probably build a new grain elevator during the present year. No plans have yet been made up.

Architect Martin Fisher, 2156 Central avenue, Cincinnati, has completed plans for an addition to the factory of the Union Furniture Company, Batesville, Ind., that will be 30 x 130 ft., four stories, of brick construction.

The Cincinnati Iron & Steel Company, Cincinnati, is having plans prepared for an addition to its plant that will be principally used for storage purposes.

The Miami Cycle & Mfg. Company, Middletown, Ohio, is contemplating enlarging its plant at an early date. In case present plans are carried out considerable equipment will be required.

The Runyan Machine Shop, Portsmouth, Ohio, is a new partnership formed by W. W. Wilbur and Howard Runyan, to operate a general repair and construction shop.

The Gem City Machine Company, Dayton, Ohio, has purchased the general machine shop of the late W. U. Colthar, Springfield, Ohio. It will be enlarged and considerable machine shop equipment is now being purchased.

The addition to the plant of the Robbins & Meyers Company, Springfield, Ohio, recently mentioned, will be 65 x 262 ft., four stories, of reinforced concrete construction. The company manufactures electrical equipment and specialties.

The New Columbus Buggy Company, Columbus, Ohio, succeeds the defunct Columbus Buggy Company. Charles A. Finnegan, of the E. R. Thomas Motor Car Company, Buffalo, N. Y., is president. It is currently reported that the plant will be refitted for the manufacture of automobiles.

The Godman Shoe Company, Columbus, Ohio, will

fit up the McKee Building to be used for the manufacture of shoes.

The Scioto Box Company, Columbus, Ohio, has been purchased by Thaddeus Troy, of that city, and will be enlarged at an early date.

The Lancaster Paper Mill Company, Lancaster, Ohio, has been incorporated with $100,000 capital stock by A. B. Smith and others.

Wheeling

WHEELING, W. VA., May 18, 1914.

The town of Adamston, W. Va., has voted $20,000 of bonds for waterworks and sewer.

The Humphrey Pump Construction Company, Wheeling, W. Va., has been incorporated with $100,000 capital stock by George A. Laughlin, J. C. Brady, F. DuP. Thompson, and others.

Andrew J. Baggs, Harry Sharpe, William W. Scott, and others, of Huntington, W. Va., have organized a company with $200,000 capital stock to manufacture mine cars and handle general mining supplies.

The Mound City Cut Glass Works, Moundsville, W. Va., has been incorporated with $25,000 capital stock by T. S. Riggs, T. J. Sullivan, C. A. Showacre, and others.

Birmingham

BIRMINGHAM, ALA., May 18, 1914.

Outside of the demands from agricultural sections where there is a brisk business in implements owing to prospect of good crops, the machinery trade continues dull. A few new mine openings have resulted in sales of engines, boilers and pumps, together with some electrical equipment.

The Ingalls Iron Works, Birmingham, has let the contract for the construction of a structural iron and steel plant. The buildings will be of steel and concrete, one story, and will cost $100,000.

The Fitzgerald Compress Company, Fitzgerald, Ga., has been incorporated with a capital stock of $35,000, and the privilege to increase it to $100,000. E. K. Farmer, W. R. Garburt, and others, are the incorporators. A cotton compress will be established.

The Automatic Ice Company, Savannah, Ga., has been incorporated with a capital stock of $100,000 by F. W. Edwardy, and others, who will establish an ice factory.

The Montezuma Light & Power Company, Montezuma, Ga., has been incorporated with a capital stock of $20,000 and the privilege to increase it to $100,000.

The Purity Ice Company, Tampa, Fla., has been incorporated with a capital stock of $60,000 and will establish an ice plant. M. E. Gillett, G. R. McKean, and others, are interested.

The Ocala Iron Works, Ocala, Fla., will build a plant in place of the one recently burned.

The Central South

LOUISVILLE, KY., May 18, 1914.

Machinery trade continues to lag, though occasionally reports of satisfactory business are heard. Boiler manufacturers are much interested in the expenditure of $1,000,000 for new school buildings in Louisville, as steam heating plants for these buildings will require a considerable number of boilers. J. Earl Henry, architect for the board of education, is drawing plans for a $300,000 boys' high school building, while plans for ward schools to cost about $100,000 each are being drawn by Ward & Glossop, Joseph & Joseph, and John B. Hutchings. Specifications for these schools will be ready in the near future. Electrical equipment, machine tools and other lines are all reported quiet at present, as industrial operations are generally retarded in this territory.

The Kentucky Stamping Company, Louisville, has been incorporated with $25,000 capital stock by Albert Terstegge and others. It makes a line of sheet metal specialties. No extensions in its plant are planned at present.

The Rector Sanitary Heating Company, Louisville, has been incorporated with $75,000 capital stock by H. V. Bomar and others. It is expected that a plant will be built for the manufacture of hot-air furnaces. Mr. Bomar is president of the Bomar-Summers Hardware Company.

The Southern Textile Machinery Company, Paducah, Ky., has increased its capital stock from $30,000 to $150,000, and is planning to enlarge the scope of its operations. F. E. Lack is president.

The American Metallic Packing Company, Lexington, Ky., is reported to be in the market for a 250-hp. Corliss engine. A used machine will be given the preference.

C. L. Morris, Murray, Ky., is reported to have plans for the establishment of a plant to manufacture lead pencil material. Woodworking machinery will be required.

A plant for the manufacture of tire and wheel rims will be equipped at Winchester, Ky., by George Tomlinson, being an addition to his present plant.

The George Bohon Company, Harrodsburg, Ky., will erect an addition to its vehicle factory.

The city of Mount Vernon, Ky., has plans for the early construction and equipment of a waterworks plant. The mayor should be addressed.

The city of Bromley, Ky., is inviting bids for the equipment of a waterworks plant. George Pearce, city clerk, Ludlow, Ky., should be addressed.

J. M. Kearne, Columbia, Ky., has purchased the machine shop of W. A. Helm.

Stevens & Kash, Viper, Ky., are in the market for conveying equipment for their sawmill.

The Lebanon Milling Company, Lebanon, Ky., which was recently organized, will use electric power for the operation of its conveying and milling machinery. R. F. Lanham is manager.

The town of Harrodsburg, Ky., is planning the installation of a motor-generator set and a 30-hp. motor for the operation of pumps at the waterworks. Albert Riley is superintendent.

The Call Machine & Supply Company, Pikeville, Ky., has been incorporated with $10,000 capital stock by J. W. Call, William P. Call, Jr., and others.

James Hinkle, Barbourville, Ky., is planning the equipment of a garage, and may need machine tools for the repair shop.

W. E. Davis, manager of the East Tennessee Coal Company at Hazard, Ky., is purchasing equipment for a new coal operation there. Electrically operated machinery will be used. The general offices of the company are at Knoxville, Tenn.

Frank Sneed, general manager of the Harlan Coal Mining Company at Coxton, Ky., is purchasing electrical equipment and coal mining machinery. General offices of the concern are in Louisville.

C. L. Goughnour, Newport, Tenn., has a franchise for the establishment of an electric light system in that city. A hydroelectric power plant will be built on Pigeon river at Hartford, Tenn.

A power plant will be built by the Standard Candy Company, 443 Second avenue, North, Nashville, Tenn.

The Federal Mfg. Company, Nashville, Tenn., has been incorporated with $100,000 capital stock for the assembling of a patented automobile wheel. J. L. Dann, J. R. Tubb, and others, are interested. It will establish a plant.

The Towe-Lemons Mfg. Company, Cedar Hill, Tenn., will establish a plant to manufacture tobacco sprayers. It is capitalized for $50,000. J. S. Adams is secretary.

The city of Tiptonville, Tenn., will equip waterworks at a cost of about $18,000 and is in the market for the equipment. G. W. Haynes is mayor. R. C. Huston, Memphis, Tenn., is the engineer.

The Gager Lime & Mfg. Company, Chattanooga, Tenn., is in the market for a stone crushing equipment of about 100 tons daily capacity.

C. M. Hendricks, Murray, Ky., is to establish a broom factory. The equipment will be motor-driven.

The Southern Lumber & Mfg. Company, Nashville, Tenn., will establish a sawmill at Oneida, Tenn.

The Nashville Cold Storage & Ice Company, Nashville, Tenn., recently incorporated, reports that its factory will have a capacity of 150 tons a day. Jesse J. Naive is president.

The American Car & Foundry Company, 165 Broadway, New York City, whose plant at Binghamton, Tenn., was recently burned, plans to replace it, according to recent reports. Loss on the buildings and equipment was $75,000.

The Southern Lumber & Mfg. Company, Oneida, Tenn., has increased its capital stock from $100,000 to $150,000, and will add equipment including a large band saw mill.

The Henry County Automobile Company, Paris, Tenn., is purchasing equipment for a garage.

St. Louis

ST. LOUIS, Mo., May 18, 1914.

Machine tool dealers continue to report inquiries very light and actual business moving even lighter. There is absolutely nothing of consequence in the way of new demand for equipment. Existing industries continue to hold down their requests for new machinery to the uttermost, awaiting an improvement in the situation. The reports from the surrounding territory continue to be of the most encouraging character so far as basic conditions are concerned. Hope is maintained that a change in the business of the dealers will develop shortly, as soon, at least, as crops are reasonably assured. Business in second hand tools is light.

The St. Louis branch of the United Drug Company, Boston, Mass., has leased an adjoining property, doubling its present capacity.

The Economy Range Heater Mfg. Company, St. Louis, has been incorporated with a capital stock of $50,000 by H. R. Jones, M. O. Hessel and William Heine to manufacture ranges, heaters, etc.

The General Equipment Corporation, St. Louis, has been incorporated with a capital stock of $25,000 by C. Y. Carr, M. B. Wallace and C. R. Scudder to engage in manufacturing.

The Automatic Electric Light Company, Kansas City, Mo., has been incorporated with a capital stock of $100,000 by F. H. Willmont, W. H. Maloney and W. F. Warner and will equip at once.

The Progress Laundry Company, Kansas City, Mo., has been incorporated with a capital stock of $30,000 by L. H. Fischer, F. W. Parker and C. F. Fisher and will establish a steam laundry.

The Phillips Lumber & Fuel Company, Cape Girardeau, Mo., has increased its capital stock from $10,000 to $50,000 for the purpose of extending its operations.

The city clerk, LaGrange, Mo., is receiving bids for equipment of a waterworks system, including one 150-gal. per min. single-acting triplex pump. J. P. Davis, Windsor, Mo., is the engineer.

The Campbell Lumber Company, Kennett, Mo., is in the market for equipment for the re-establishment of its recently burned mills. Two band saw mills, two edgers, one 5-saw trimmer, filing room machinery, shafting, etc., are required. About $35,000 will be expended.

The Robinson Adjustable Bed Mfg. Company, Chillicothe, Mo., has completed plans for the immediate construction of a plant at St. Joseph, Mo.

The Missouri Pacific Railway, J. H. Stephens, St. Louis, chief engineer, will erect a 1,000,000 bu. addition to its Kansas-Missouri elevator at Kansas City, Mo.

The Harve, Powers & Iowa Grain Company, Gentry, Mo., will equip a grain elevator, the machinery to cost about $4000.

The city of Kahoka, Mo., has authorized the expenditure of $11,000 for the improvement of the equipment of its electric light plant.

A paper mill to cost about $150,000 will be built at East St. Louis, Ill., by capitalists represented by R. W. Sikking, East St. Louis. He also represents a syndicate which plans the equipment of a steel foundry to cost about $75,000.

The Elliot Frog & Switch Company, East St. Louis, Ill., will not build a new factory in Pueblo, Colo., as has been reported in some places. It has instead purchased the building and equipment of the Steel Wheel & Wagon Company at Pueblo. The factory is approximately 100 x 300 ft., and is fully equipped.

The Walls Frogless Switch Company, Arcade Building, East St. Louis, Ill., has bought the entire plant of the Acme Tool Company, East St. Louis, and after remodeling it, will proceed with the manufacture of a patented switch. About $150,000 is involved in the purchase.

A cotton compress, to cost equipped about $80,000, will be established at Little Rock, Ark., by Joseph Newberger, of the Newberger Cotton Company, M. Beley, P. F. Groome, and others.

J. L. Roberts, Magazine, Ark., has obtained a franchise to supply electricity to that city and will build a plant at once.

The Haygood-Seminary Light & Traction Company, Washington, Ark., has been incorporated with a capital stock of $25,000 by R. Carter, and others, and will erect a plant.

The Kurz-Downey Company, Little Rock, Ark., has been incorporated with a capital stock of $100,000 by W. F. Kurz, N. I. Downey and A. C. Thompson to engage in lumber manufacturing and will install woodworking machinery.

The Arkansas Lime Company, Ruddells, Ark., is in the market for several 300-hp. boilers, attached direct to alternating current generators, and will also install special equipment for handling 200 tons of ground lime stone and 200 tons of sand daily.

The Weiner Rice Mill, Weiner, Ark., recently burned, will be rebuilt at a cost of about $100,000 by the Anheuser-Busch Brewing Association, St. Louis.

The Winslow Automobile Company, Fort Smith, Ark., has been incorporated with a capital stock of $15,000 by L. F. Brock, R. N. Winslow and S. L. Williams, and is in the market for tools for a repair shop.

The Van Veneer Company, Malvern, Ark., has purchased a mill and will equip it for the manufacture of panels, backing, face stock, etc., requiring some wood-working machinery in addition to that bought.

The city of Collinsville, Okla., will expend about $16,000 on a waterworks plant. The mayor should be addressed.

Chicago parties have taken over the electric street railway lines at Ardmore, Okla., under the name of the Ardmore Electric Railway Company and will make extensive improvements and extensions of the system and plant. George S. Cravens is president.

The city of Wilson, Okla., will install an electric light plant. W. J. Whitely, Homestead, Okla., should be addressed.

The Washita Electric Power Company, Pauls Valley, Okla., will install a 200-kw. direct-connected generating unit.

The Jackson Cotton Oil Company, Jackson, Miss., has been incorporated with a capital stock of $50,000 by M. Green, Sr., and others, and will equip a cotton seed oil mill.

The Stewart Sash, Door & Blind Company, Gulfport, Miss., has not decided definitely upon plans for rebuilding its plant, recently destroyed by fire. When the rebuilding is settled upon the company will be in the market for one 125-hp. boiler and one 100-hp. engine. R. L. Stewart is in charge.

Texas

AUSTIN, TEXAS, May 16, 1914.

There is an especially active demand for irrigating machinery at this time. The cotton gin machinery market is also good.

The Texas Light & Power Company, Dallas, will begin work at once on a large power plant at Gainesville, costing $50,000, which will furnish current for local consumption and for interurban lines in northern Texas. It already owns one plant here. The second plant will be erected in another part of the city.

R. M. Collins and W. A. Hale, Round Mountain, will erect a cotton gin and grist mill.

The Farmers Gin Company, Venus, recently organized with a capital stock of $12,000, will erect a 100-bale cotton gin.

The Western Gin Company, recently organized at Onley, with a capital stock of $10,000, will erect a cotton gin. J. C. Wright is interested.

The Fresnos Land & Irrigation Company, Brownsville, has increased its capital stock from $60,000 to $100,000 and will make extensive improvements and additions to its irrigating system.

The Llano Milling & Mfg. Company, Llano, is planning to build an ice factory.

The Rio Grande Canal Company, Brownsville, is planning to enlarge its irrigation system in the lower Rio Grande valley, and has increased its capital stock from $60,000 to $100,000 for the purpose.

Andrew J. Holmes, Carthage, will erect an electric light plant at Buffalo, to be in operation by July 1.

The Long Leaf Lumber Company, organized at Texarkana, with a capital stock of $500,000, will take over the properties of the Bayou Rapids Lumber Company, including a large milling plant at Alexandria, La. It is stated that this plant will be improved and enlarged and other saw mills erected in Louisiana. Noah P. Sanderson is president and J. K. Wadley, secretary and treasurer.

The Tempe Cotton Growers' Association, Tempe, Ariz., will erect a large cotton gin. C. G. Jones and John Birchett are directors.

The Crestonio Gin Company, Crestonio, will build a cotton gin costing about $10,000. F. G. Hillje and W. R. King are interested.

The Pacific Coast

SEATTLE, WASH., May 11, 1914.

The machinery market presents nothing particularly interesting or new, but both manufacturers and sales agents believe conditions will improve shortly, despite a present lack of inquiries. Considerable mining machinery has been contracted for in the past few weeks. Milling machinery is still being purchased in small lots. Irrigation activities throughout Oregon and eastern and central Washington have created a noticeable demand for pumping machinery.

The Port Orchard Product Company, Port Orchard, Wash., will build a creamery to cost about $25,000. Work will start immediately. E. F. Klemptner is in charge. Machinery for the plant has not been purchased.

Sibley & Hotchkiss, Seattle, Wash., are having plans prepared for the construction of a cold storage plant at Port Angeles, Wash., which it is reported will cost about $350,000.

C. D. Mayhugh, LaConnor, Wash., is making plans for the erection of a brick and tile factory to cost about $15,000.

S. A. Buck & Sons, Monroe, Wash., have secured a site in Eugene, Ore. for a box and crate factory. The plant will be operated by electricity and will require some machinery equipment.

The Kelso Water Company, Vancouver, Wash., has been incorporated with a capital stock of $30,000 by W. E. and Bert Yates.

The Liberty Lumber Company, Seattle, has increased its capitalization by $20,000. The additional funds are to be used in improvements to its mill.

The Doernbecher Mfg. Company, Portland, Ore., furniture manufacturer, is adding a third floor to its factory, which is 105 x 110 ft., and is building an addition 100 x 150 ft., six stories.

The Adams County Light & Power Company, Weiser, Idaho, announces that it will erect a power plant.

The city of Los Angeles, Cal., has voted $6,500,000 of bonds to be used to build a power plant to develop power from the Los Angeles aqueduct and for a distributing system.

Eastern Canada

TORONTO, ONT., May 16, 1914.

The Electro Metals, Ltd., Welland, Ont., manufacturer of ferrosilicon, has increased its capital stock from $300,000 to $1,000,000.

The Town Council, Tottenham, Ont., will spend $16,000 for a waterworks system of 60,000 gal. daily capacity. The pumps are to be steam driven and will have domestic pressure of 60 lb. and a fire pressure of 100 lb. to the sq. in. E. A. James, Toronto, is the consulting engineer.

Arrangements are being made for the reconstruction of the plant of the Standard Clay Products Company, New Glasgow, N. S., recently destroyed by fire. W. C. Trotter is president.

The Guelph Radial Railway Company, Guelph, Ont., is having plans prepared for improvements to its power house. A. H. Foster is general manager.

The Union Cement Company, Owen Sound, Ont., will erect a large mill and in return has asked the town to give a loan of $60,000 for ten years.

The City Council, Wallaceburg, Ont., has passed a by-law to grant $200,000 for a waterworks system.

The ratepayers of Little Current, Ont., have passed a by-law to grant $12,000 for the erection of a civic electric plant.

The Port Colborne Tug Company, Ltd., Port Colborne, Ont., has been incorporated with a capital stock of $40,000 by Thomas Lannan, J. D. McGrath, J. H. McGrath, and others, to build tugs, barges, etc.

The Canada Lock Company, Ltd., Hamilton, Ont., has been incorporated with a capital stock of $60,000 by Henry Carpenter, and others, to manufacture locks, etc.

The Ford-Smith Machine Company, Ltd., Hamilton, Ont., has been incorporated with a capital stock of $100,000 by Percy Ford-Smith, S. W. C. Scott, and others, to manufacture machinery, tools, etc.

The National Rubber Company, Ltd., Hamilton, Ont., has been incorporated with a capital stock of $500,000 by George Wenig, D. B. Wood, R. W. Long, and others, to manufacture rubber boots, automobile tires, etc.

The Masson Development Company, Ltd., Montreal, has been incorporated with a capital stock of $200,000 by Raymond Masson, C. A. Harwood, and others, to construct and operate mills, machine shops, etc.

Western Canada

WINNIPEG, MAN., May 15, 1914.

Tenders are wanted until May 23 by W. H. Montague, minister of public works, Winnipeg, Man., for boilers and automatic stokers.

The ratepayers of Wetaskiwin, Alta., have passed a by-law to grant $31,000 for a gas plant and $7000 for a waterworks system.

The ratepayers of Calgary, Alta., have passed by-laws to grant $370,000 to be used for a public market, water and sewer extensions.

The ratepayers of Saskatoon, Sask., have passed by-laws to grant $271,512 for additions to the sewer and waterworks systems.

The Winnipeg Paper Box Company, Winnipeg, will open a branch factory at Edmonton, Alta., for the manufacture of paper boxes, etc. W. J. Milford is in charge.

The town of Shoal Lake, Man., F. Dobbs, secretary, will receive bids until 6 p. m., May 28, for an electric lighting plant.

The British Columbia Steel Works, Ltd., Vancouver, B. C., has been formed by F. L. Leighton, J. J. Banfield, Nicholas Thompson, and others, to erect a rolling mill to utilize the large quantities of scrap that are being wasted annually in that province.

The Lethbridge Face Brick & Clay Products Company, Lethbridge, Alta., has purchased a tract of 16 acres, on which it will erect a plant.

E. Hanson, city electrical engineer, Saskatoon, Sask., will receive bids until noon, May 30, for boilers, stokers, economizers and superheaters.

Plans have been completed by the Consolidated Engineering Company, Vancouver, B. C., for a large drydock to be constructed at Vancouver at an estimated cost of about $6,000,000. It will be 1120 ft. long and 110 ft. wide, operated by electricity and equipped with machine shops, etc.

The plans have been completed by the Public Works Department, Ottawa, Ont., for a drydock at Esquimalt, B. C. It will be 1150 ft. long, 40 ft. deep and 120 ft. wide. The equipment includes three centrifugal pumps of 60,000 gal. capacity, and will cost $5,000,000.

Government Purchases

WASHINGTON, D. C., May 18, 1914.

Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, until June 9, schedule 6801, for one 18-in. x 6-ft. geared head engine lathe for Boston.

Plans and specifications may be had from the Bureau of Yards and Docks, Navy Department, Washington, until June 6, for furnishing and installing a complete heating and pumping plant, etc., for the United States Naval Hospital, Chelsea, Mass.

Bids will be received by the Engineer Depot, Washington, until June 12, for furnishing motor-driven centrifugal pumps.

Bids will be received by the U. S. Engineer Office, Burke Building, Seattle, Wash., until noon, June 15, for furnishing machinery and valves for the Lake Washington canal locks.

The Bureau of Engraving & Printing, Washington, will receive bids for furnishing one electric freight truck of 4000 lb. capacity, length of body 10 ft. 2 in., maximum weight not over 2030 lb. The purchasing agent is in charge and no date for closing of bids has been set.

Bids were received at the Bureau of Supplies and Accounts, Navy Department, Washington, on May 12 for furnishing material and supplies for the navy yard as follows:

Schedule 6633, Yards and Docks

Class 3, Bid A—Mare Island—Two 20-hp. vertical fire tube boilers. Bid 51, $595.

Bid B—San Francisco—Same—Bid 51, $585.

Bid C—F.o.b. works—Same—Bid 51, $445; 80, $377 and $426.

Schedule 6634, Construction and Repair.

Class 12, Puget Sound—Four hoists—Bid 94, $610.25; 166, $536; 216, $545.

Alternate bid—Same—F.o.b. works—Bid 46, $671.40; 54, $619; 94, $562.50; 216, $525.

Schedule 6635, Steam Engineering.

Class 22, Mare Island—One air compressor, one compressor governor, and one air gauge—Bid 101, units; 213, informal; 223, $135.

Alternate bid—Same—F.o.b. works—Bid 82, $189.60; 101, units.

Schedule 6673, Steam Engineering.

Class 101, New York—Blading material for Curtis turbines—Postponed.

Schedule 6696, Steam Engineering.

Class 181, Norfolk—18 pumps—Bid 29, $1962.50; 56, $1976.50; 225, $2173.

The following bids were received by Lieut.-Col. J. E. Kuhn, Corps of Engineers, Washington, on May 7 under specification No. 64 for furnishing two motor generator sets, 10 kw.:

General Electric Company, $662; add $85 for compensators; delivery in 30 days.

Ridgway Dynamo & Engine Company, $900 for both sets; $115 for controller.

Westinghouse Electric & Mfg. Company, total, $964.58; 80 days.

Allis-Chalmers Company, generator sets, $640; controller, $122; delivery in 145 days.

W. Irwin Cheney, generator sets, $800; controllers, $80; 40 days.

Diehl Mfg. Company, generator sets, $970; controllers, $100; 60 days.

C. & C. Electric & Mfg. Company, generator sets, $883; controllers, $315; 50 days.

B. F. Sturtevant Company, sets, $956.20; controllers, $93.80; 40 days.

National Electrical Supply Company, sets, $1322; controllers, $180; 90 days.

Western Electric Company, total, $900; 60 days.

Richmond Electric Works, total, $825; 40 days.

A. H. McCay, $940; 45 days.

Trade Publications

Ceiling Sockets.—Security Insert Company, Thirty-third and Arch streets, Philadelphia, Pa. Circular. Concerned with a ceiling socket for concrete work, which is designed to be fastened to the form at the time the material is placed. It is intended for use in connection with bolts for supporting shafting, etc. Views of the insert, showing it nailed to the form and with the bolt and nut in position, are given.

Gray-Iron and Bronze Castings.—George F. Shevlin Mfg. Company, Saratoga Springs, N. Y. Pamphlet. Describes briefly the plant of the company, the text being supplemented by a number of engravings of the equipment. Views of some of the castings produced in the foundry, which range from 5260 to 46,460 lb., are given.

Wall Radial Drilling Machine.—Vulcan Engineering Sales Company, 2059 Elston avenue, Chicago, Ill. Form No. 82. Presents a brief description with an illustration of a wall type of radial drilling and reaming machine designed to meet the needs of plants where large surfaces have to be covered for drilling and reaming. The special features of the machine, which can be bolted to a column or wall of a building or mounted on a car are centralized control and rugged construction. An illustrated description of this machine appeared in *The Iron Age*, February 12, 1914.

Motor-Driven Pumps and Bell Ringing Transformers.—Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa. Section No. 3082 of catalogue No. 3002-A, and folder No. 4172. The first is devoted to the application of electric motor drive to pumps of various sizes and kinds. The special advantages of motor drive, such as great reliability, long life, low first and operating costs, easy control, etc., are briefly touched upon, followed by descriptions of various applications, the text being supplemented by numerous illustrations. These range from the small motor-driven house pump to a 24-in. centrifugal unit, having a daily capacity of 24,000,000 gal. The folder illustrates and describes briefly a bell ringing transformer, which is designed for use in connection with lighting circuits, as a substitute for the dry and wet cell batteries, formerly used for this purpose.

Gears and Pinions.—Van Dorn & Dutton Company, Cleveland, Ohio. Describes and illustrates an extensive line of gears and pinions for railway and mill motors. This includes split or solid standard gears made from open-hearth steel castings, special gears of steel possessing a higher carbon content than the standard ones, gears of heat and oil treated open-hearth steel, used especially in high speed and suburban traction work and heavy duty mill service, gears made from specially hardened open-hearth steel and solid forged or rolled gears, which can be furnished in any of the grades of steel mentioned. The line of pinions includes special steel, heat and oil treated and hardened pinions, and one machined from hammered steel of high tensile strength for railway and mill service.

Steel Strips.—West Leechburg Steel Company, Farmers Bank Building, Pittsburgh, Pa. Pamphlet. Illustrations and descriptive matter explain the process of manufacturing strip steel, views being given of a number of the different operations. A brief description of the plant is given, together with a number of suggestions concerning information to be given when ordering cold rolled steel.

Pipe Threading and Cutting-Off Machines.—Cox & Sons Company, 519 Lafayette Building, Philadelphia, Pa. Catalogue. Illustrates a few sizes and types of pipe threading and cutting-off machines, with particular reference to the various methods of driving. The machines cover a wide range of sizes for handling pipe from 3 to 18 in. in diameter. The belt-driven machine is the standard of the company, but both motor-driven and engine-driven machines can be built to order. In connection with the illustrations of the different machines, brief descriptions are given.

Forge Hammers.—Nazel Engineering & Machine Works, 4041 North Fifth street, Philadelphia, Pa. Catalogue. Supersedes all previous editions and describes a self-contained forge hammer that compresses its own air and can be installed wherever belt or electric power is available. The special features of the hammer, which can be geared directly to the motor if desired, are touched upon, followed by illustrations of the different types built. Data on the amount of power consumed, the force of the blow, etc., are included, together with indicator diagrams, and a curve showing the movement of the compressor piston and the hammer ram.

Pneumatic Hoists.—Whiting Foundry Equipment Company, Harvey, Ill. Catalogue No. 107, superseding No. 93. Gives general description and specifications for a line of air hoists for use in foundries. After a brief general description of the construction of the hoist, the special features of each particular type are pointed out with illustrations of them. Special attention is directed to the Mason automatic valve which is claimed to hold the load positively at any point. Mention is made of horizontal hoists and air jacks.

both of which are illustrated. A number of views showing the hoists in use in foundries are included.

Oil Forge.—Word Brothers, 60 Castro street, San Francisco, Cal. Folder. Gives an illustration and brief description of a fuel oil forge, designed especially for heating rock drills and general blacksmith work. The oil is atomized under high pressure and is delivered to the flames with a large supply of low pressure air, to give complete combustion. The forge is adapted for general blacksmithing work where welding heats are required, and can be changed readily for heating drill steel or for other purposes where a steady and uniform heat is desired. An illustrated description of the forge appeared in *The Iron Age*, February 5, 1914.

Gas and Gasoline Engines.—Emerson-Brantingham Implement Company, Rockford, Ill. Catalogues Nos. 2E and 13. The first pertains to a line of open jacket or hopper cooled gasoline engines which are built in sizes ranging from 1½ to 16 hp. These are furnished either in stationary outfits or mounted on skids and hand or horse trucks. The features of the engines, such as the cooling system and valve construction, are described, after which the different sizes are shown with the various mountings. The second catalogue calls attention to the Geiser line of gas and gasoline engines, which are furnished in 2 and 4 hp. sizes. The construction of these engines is gone into at some length, the text being supplemented by a number of engravings of different parts. Mention is also made of a stationary engine that can be supplied in sizes ranging from 6 to 22 hp.

Pneumatic Tools.—Keller Pneumatic Tool Company, Fond du Lac, Wis. Catalogue. Describes a line of pneumatic tools, which includes riveting, chipping, caulking, flue beading and scaling hammers, pneumatic drilling machines and sand rammers. Views are given of the different tools in the several sizes and styles that can be furnished, and there are a number of detail drawings with dimensions. Sectional views of the hammers and numbered repair part lists are also included.

Grinding Wheel Guards.—Ransom Mfg. Company, Oshkosh, Wis. Bulletin S.D. 1. Mentions a line of safety devices for abrasive wheels, which are made in two different styles to inclose the grinding wheels either partially or entirely. Steel castings are used for the guards for wheels ranging from 16 to 24 in. in diameter, while cast iron is employed for wheels between 8 and 14 in. in diameter. Views of the four different types of guards are shown, and there is a diagram illustrating the use of the guard with a full sized wheel and one which has become badly worn.

Pneumatic Tools.—Monarch Pneumatic Tool Company, Railway Exchange Building, St. Louis, Mo. Six circulars. Point out the advantages of a line of pneumatic tools that includes drilling machines, wood boring machines and riveting and chipping hammers. Brief specification tables of the various tools are included on each circular.

Coal Cutting Machines.—Jeffrey Mfg. Company, Columbus, Ohio. Bulletin No. 129. Illustrations and descriptive matter explain the operation of the Arcwall coal cutter for use in connection with the overcutting system of mining. The special advantage claimed for the machine, which is of the locomotive turret type, is the securing of a greater and better output at a reduced cost. A number of engravings of the machine in use are given, as well as views of the different sizes and several diagrams showing the manner of operating the machine are included.

Brass and Iron Goods and Specialties.—Kelly & Jones Company, Greensburg, Pa. Catalogue M. This is the company's 1914 catalogue and price list, describing and illustrating brass and iron goods and specialties for steam, gas, water and oil. Illustrations are relied upon for the most part to describe the goods, but there are a number of cases in which brief text descriptions are included. Tables of sizes and prices are given, and there is a very comprehensive index arranged both alphabetically and numerically.

Frogs and Switches.—Helmick Foundry-Machine Company, Eighth street, Fairmont, W. Va. Pamphlet. Illustrates a line of frogs, switches and crossings for mine service. Connecting rods, and switch throws and stands, are also illustrated, and a table of frog and switch data is included.

Portable and Semi-Portable Steam Engines.—Heinrich Lanz, Mannheim, Germany; Wiener Machinery Company, 50 Church street, New York City, American representative. Catalogue. Refers to a line of portable and semi-portable engines using superheated and saturated steam. The special advantages claimed for these engines, which are fitted with the Lentz patent valve gear, are reduced heat losses, sensitive governing of varying loads, safety in operation, low cost of maintenance and ease of inspecting and replacing the valves. A general description of the construction of the various parts of the engine is given, the text being supplemented by numerous illustrations. Views are also given of the several styles of engines that can be supplied with specifications on the pages facing the engravings. A number of illustrations of installations are presented.

Portable Electric Tools.—Stow Mfg. Company, Binghamton, N. Y. Bulletin No. 88 and folder. The former shows a two-spindle, portable electric drill, in which one spindle is driven at the rate of 450 r. p. m., and will handle straight shank drills up to ½ in., while the other spindle is designed for Morse taper shank drills up to ¾ in., and operates at a speed of 225 r. p. m. The advantages claimed for this arrangement as compared with the one-spindle two-speed machine are that greater power for heavy drilling is provided by the large spindle and both spindles can be reversed easily. The folder contains a number of engravings of various portable electrically driven machines, such as tool post and bench grinding machines, portable emery grinding machines with electric motor or rope drive and a combination light drilling, boring, emery grinding and buffing machine that is portable and will revolve in a complete circle.

Power Saw.—W. Robertson Machine & Foundry Company, Buffalo, N. Y. Leaflet. Relates to a line of power saws for cutting round and square stock, structural shapes, etc. Illustrations of the three larger sizes are given with a brief description of their construction, and the work for which they are adapted. An illustrated description of the two-speed mechanisms with which these saws are equipped, appeared in *The Iron Age*, February 5, 1914.

Spring Machinery.—Sleeper & Hartley, Worcester, Mass. Bulletin Nos. 277 and 280. The first deals with a line of spring hooking machines which are designed to produce any desired form of hook or loop for either right or left hand springs without changing the tools. Views of some of the different styles of hooks are presented, together with engravings of two of the machines. Condensed specifications of the several sizes are included. The second bulletin treats of a special spring coiling machine, which is made in five different sizes. These machines are adapted for the production of extension or compression springs and can be equipped either for continuous coiling in long lengths or for intermittent coiling and cutting at predetermined lengths. A view of one of the machines is given and a table of sizes and capacities of the five machines is included.

Tramrail Systems, Trolleys and Electric Hoists.—Brown Hoisting Machinery Company, Cleveland, Ohio. Catalogue D. Shows a number of installations of the overhead or tramrail system for handling material of all kinds, together with the various trolleys and electric hoists that are used on it. Each of the different styles is illustrated and described, the text of the latter in some cases being supplemented by engravings of the different parts, and specification tables are included. The views of installations show the apparatus in use for handling coal, coke, ashes, lumber, miscellaneous freight, flasks and castings in a foundry, materials in and out of chemical vats and loading and unloading supplies at warehouses.

Automatic Guard for Punch Presses.—H. & A. Lock Company, 156 Fifty-third street, Brooklyn, N. Y. Pamphlet. Describes and illustrates an automatic guard for preventing the operators of punch presses from having their hands caught. The guard operates automatically at each revolution of the crank and the clutch cannot be thrown in until the guard is raised to a nearly vertical position. A number of views showing the guard in different positions are included.

Superheaters.—Babcock & Wilcox Company, 85 Liberty street, New York City. Booklet. Contains a history of the use of superheated steam, together with data on its properties and the advantages of using it. This occupies a considerable portion of the booklet, the remainder being given over to a description of the superheater and its application to various typs of boilers, with illustrations of the different parts and a number of plants in which they have been installed.

Patterns for Castings.—Cleveland Castings Pattern Company, 1930 East Sixty-first street, Cleveland, Ohio. Folder. Calls attention to the new plant of the company and the increased facilities afforded for the making of patterns for castings of all kinds. A map showing the location of the plant with special reference to shipping facilities and an exterior view of the building are included.

Bronze Alloys and Babbitt Metals.—Lumen Bearing Company, Buffalo, N. Y. Booklet. Relates to a line of bronze, brass and aluminum alloys and babbitt metals. In connection with each alloy there is given a brief statement of the uses to which it can be put, together with the results of various tests that have been made. The babbitt metals are briefly described, both as to composition and the uses which may be made of them. In connection with the alloys, data are given on tests made on chilled and cast bars, as well as the results of the Brinell hardness tests. Mention is also made of the special bronzes and die castings which this company is prepared to furnish.